voor mijn grootvader

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Verlating, verwaarlozing en verandering. Aspecten van de Laat-Romeinse samenleving in Noord-Gallië.

UNIVERSITEIT GENT

Faculteit Letteren & Wijsbegeerte

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Abandoned, neglected and revived

Aspects of Late Roman society in Northern Gaul

Proefschrift voorgelegd tot het behalen van de graad van
Doctor in de Archeologie

2016

Preface

This research has been part of the joined research project by Ghent University and the Vrije Universiteit Amsterdam, titled: "*Decline and fall? Social and cultural dynamics in the Low Countries in the Late Roman Empire (AD 270-450)*". This project was funded by the Research Foundation Flanders (FWO) and the Netherlands Organisation for Scientific Research (NWO) (GA04612N) which was set up under guidance of Prof. Dr. Nico Roymans (VU) and Prof. Dr. Wim De Clercq (UGent) and carried out in collaboration with Dr. Stijn Heeren (VU).

Acknowledgements

It takes a village, ... and more.

First and foremost I want to thank my promotor, Prof. Dr. Wim De Clercq, for giving me the opportunity to participate in this research project and for the support and guidance provided over the past four years. Also a word of gratitude towards Prof. Dr. Nico Roymans and Dr Stijn Heeren for their encouragement, assistence and discussions provided over the course of the project.

Not only did this research cross international borders, it also crossed disciplinary borders, which offered me the chance to work with many lovely people. Let me start close to home and thank my fellow HARG-members for the fruitful discussions and pleasant meetings, but also to provide the occassional excavation or field survey which has become highly desired after becoming an 'indoor' archaeologist. I would also like to thank Prof. Dr. Peter Vandenabeele for incouraging the collaboration between the Archaeology and Analytical Chemistry department, of which a special thanks goes to Sylvia Lycke for introducing me in the world of XRF and for the good company on the many long days of measuring. Additional gratitude goes to Dr. Bart Vekemans, Jolien Van Pevenage and Anastasia Rousaki for their help that has been essential to this research. Also a word of gratitude to Jan Garrevoet and Pieter Tack for their swift help.

Furthermore, I am also very grateful to dr. Patrick Quinn (University College London), dr. Eric Goemaere (Belgian Geological Service), Ole Stilborg (SKEA) and Prof. Dr. Patrick Degryse (KUL) for introducing and guiding me into the world of ceramic petrography. Each of them has been a decisive influence over the course of this research. Also, special thanks to dr. Steve Willis, dr. Ellen Swift and dr. Luke Lavan for granting me a visiting research fellow at Kent University and showing me the ways of British archaeology and Late Antiquity. Among the many people I've encountered on my brief trip across the

Channel, a particular word of thanks to dr. Rob Collins (Newcastle University) and Sofia Turk (Durham University) for showing me the North and by turning theoretical conferences into a good time. Additionally, I also want to express my gratitude to Clarissa Agricola (Goethe Universität Frankfurt) for working together towards understanding a a major part of this research. I would also like to thank Prof. Dr. Frank Vermeulen, Prof. Dr. Koen Verboven and Prof. Dr. Arjan Zuiderhoek for their support and participation in an effort to bring young researchers from archaeology and history closer together.

In addition, many institutions were so kind to allow access and analyses on objects from their collections. For that I want to thank first the Gallo-Roman Museum of Tongeren, especially Guido Creemers, Else Hartoch and Igor Van den Vonder. Also the Flemish Heritage Agency, with a very special thanks to Sofie Vanhoutte and Sylvia Mazereel, but also RAAKVLAK, the Roman Museum of Oudenburg, the Provincial Archaeological Museum of Velzeke, the Royal Institute for Cultural Heritage, the Volksmuseum Deurne, the Gemeentemuseum Temse and the former KLAD. I also want to express my thanks across the border to the Netherlands, in particular the Museum for Antiquities in Leiden, the Archaeological Service Nijmegen and the Kam Museum in Nijmegen. I would also like to thank the participation of the commercial archaeology from Studiebureau Archeologie, BAAC Vlaanderen, ADAK, VEC and De Logi and Hoorne. Of course, an additional note of gratitude goes towards my former colleagues at GATE.

Deserving of special mention are my colleagues from the Archaeology Department at Ghent University of whom many have become friends rather than colleagues and I want to thank them especially for their help and support in the last couple months. So thanks to: Maxime Poulain, Possum Pince, Thomas Van De Velde, Jan Trachet, Jeroen De Reu, Dimitri Van Limbergen, Wouter Gheyle, Jeroen Verhegge, Dimitri Teetaert, Sadi Marechal, Davy Herremans, Devi Taelman, Sophie Dralans, Lieven Verdonck, Sibrecht Reniere, Tim Clerbaut, Liesbeth Messiaen and Karen Ryckbosch. Also a thank you note to Joris Angenon for his excellent drawings and Gitte Callaert for the help with the lay out.

And finally, I want to express my gratitude towards Lotte Van der Stockt and Lien De Ridder for keeping me fed and goal-orientated, as well as for their help with proof-reading and timely distractions. For which I also would like to thank Ben Cassier, Bert Camerlinck. And of course a big thank you to all my friends who showed much faith, understanding and support despite having no clue as to what exactly it was that I filled my days with: Jimmy Huybrecht, David Schouppe, Jelle Stevens, Koen Vanacker, Joachim Buyse, Cédric Verbeken, Inge De Brakeleer, Sarah De Vogelaer, Ilke De Meyer, Michael De Saedeleer,

Inge Vanacker, David De Bolle, Joeri De Bolle, Karlien D'haeseleer, Thijs Van Laeren, Hashini Amarasekara, Lisa De Cock, Liesbeth Eeckhaudt, Kristof Swinnen, Peter De Landsheere, Elien Lefevere, Sofie Raes, Céline Blomme, Femke De Cremer, Delfien Schadron, Sofie Permentier, Jorie Soltic, Kim Vandamme, Benedikt De Vos, Filip Beunis, Lore Van Kerckhove, Koen Verbeke, Steffi De Greve, Nele De Decker, Evelien Cochez, Ina Muylaert, Siegrid Van Muylem. An additional shout-out goes to my friends from the Academia Belgica for their support, cheerfulness and lessons in French in the final months: thanks Roxanne Loos, Stéphanie Derwael, Denis , Jeroen Wijnendaele, Coline Lefranc, Adélaïde Lambert, Stephanie Goncalves, Jean-Christophe Dauphin, Anthony Alvarez Melero and Laura Sandrin.

And of course much thanks to my family that has been very supportive all the way: Silke Van Thienen and Frederik Lerno, Gisela Van den Brande and Jean Emmerechts, Freddy Van Thienen and Wies Groffils.

List of Abbreviations

PPL	Plain polarised light
XP	Crossed polar
TV	Type value
QV	Quality value
XRF	X-ray Fluorescence
AXIL	Analysis of X-rays by Iterative Least Squares
CV	Coefficient of variation

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Part 1 Introduction

1
Introduction

‘Post interitum rebellium tyrannorum, quos ad haec temptanda quae moverunt, rabies egit et furor, velut impiis eorum manibus Romano sanguine parentantes, persultant barbari Gallias, rupta limitum pace; hac animati fiducia, quod nos per disiunctissimas terras arduae necessitates adstringunt.’

‘After the death of those rebellious tyrants whom mad fury drove to attempt the designs which they projected, the savages, as if sacrificing to their wicked Manes with Roman blood, have forced our peaceful frontier and are over-running Gaul, encouraged by the belief that dire straits beset us throughout our far-flung empire.’

Ammianus Marcellinus XV.8.6 (translation Loeb Classical Library)

1.1 On Late Roman Gaul

Rome, AD 355.

These were the words spoken by *Augustus* Constantius to his cousin Julian, when he was appointed *Caesar* in front of the imperial troops to restore order in Gaul after word that the ‘savages’ were destroying everything without opposition. This, of course, was a political manoeuvre. Nevertheless, it paints a picture on the perception of Late Roman Gaul: a province with a troublesome past and overrun by savages of Germanic origin, which are traditionally considered to have belonged to the barbarian amalgam of

Germanic groups such as the Franks, the Alamanni and the Goths to name but a few. Besides presenting Gaul as a province in ruins and chaos, Ammianus provides additional information on life at the Rhine frontier:

> "At that same time [AD 357] the savages who had established their homes on our side of the Rhine, were alarmed by the approach of our armies, and some of them skilfully blocked the road (which are difficult and naturally of heavy grades) by barricades of felled trees of huge size; others, taking possession of the islands which are scattered in numbers along the course of the Rhine, with wild and mournful cries heaped insults upon the Romans and Caesar."
>
> (AM XVI.11.8, translation Loeb Classical Library)

And also:

> "From here Julian turned aside to repair the fortress called Tres Tabernae, destroyed not long before by the enemy's obstinate assault, the rebuilding of which ensured that the Germans could not approach the interior of Gaul, as they had been wont to do. And he both finished his work sooner than was expected and, for the garrison that was stationed there, he stored up food for the needs of a whole year, gathered together by the hands of the soldiers, not without fear of danger, from the savages' crops."
>
> (AM XVI.11.11, translation Loeb Classical Library)

Evidently, Julian obtained successes in driving out the Germanic people that had destroyed and/or settled within the borders of Roman Gaul. The passage preceding the last one even speaks of the butchering of *barbarian* men and women alike that had taken refuge on the islands along the Rhine. Additionally, *Caesar* Julian rebuilt forts and manned them with official troops to protect the borders of Gaul and succeeded in creating a surplus for his troops by deploying soldiers to harvest the crops planted by the Germanic settlers. Clearly, a hostile interaction between Roman soldiers and Germanic people existed in the middle of the 4th century along the Rhine.

This was nothing new, since Julian was not the first to clean out *barbarians* in Northern Gaul. More than half a century before him, ca. AD 297, Constantius Chlorus was called to the most northern region of the Scheldt and the Rhine, i.e. the Low Countries, to set things in order:

> ‘During the whole of this period, however, you never ceased to destroy those enemies whom terra firma permitted you to approach, although that region which was liberated and purged of the enemy by your divine campaigns, Caesar, through which the Scaldis flows with its meandering channels and which the Rhine embraces with its two arms, is hardly land at all, if I may hazard the expression.’

(Pan. Lat. VIII(V).8.1 – Panegyric of Constantius, translation from Nixon and Rodgers 1994, 120).

This panegyric (Pan. 8) is an is an important testimony to the depopulation of Gaul as a consequence of the civil wars and barbarian invasions between AD 260 and 270. As well as to its subsequent resettlement with barbarian prisoners from similar campaigns as mentioned before (Nixon and Rodgers 1994, 120-121). For instance the panegyric of Constantius mentions captured Chamavi and Frisii that had become farmers and soldiers under Roman rule:

> ‘It is a pleasure, by Hercules, to exult in the name of all the Gauls together, and – I say this by your leave – to attribute the triumph to the provinces themselves. And so it is for me now that the Chamavian and Frisian ploughs, and that vagabond, that pillage, toils at the cultivation of the neglected countryside and frequents my markets with beasts for sale, and the barbarian farmer lowers the price of food. Furthermore, if he is summoned to the levy, he comes running and is crushed by discipline; he submits to the lash and congratulates himself upon his servitude by calling it soldiering.’

(Pan. Lat. VIII(V).9.2-4 Panegyric of Constantius, translation from Nixon and Rodgers 1994, 121)

The province of Gaul had seen its fair share of trouble since the death of emperor Alexander Severus in AD 235. As mentioned above, civil war and barbarian raids terrorised the land, but also economic recession and plagues can be added to the list of misfortune in the 3rd century that led to the end of the *Pax Romana* (Nouwen 2006, 35-36). Because of the political and economic instability and the external threat, scholars refer to this period as the ‘3rd century crisis’ (for further discussion, see 4.4.2.1). During 50 years after the Severi, no so-called ‘soldier emperor’ held the purple for long.

The resilience of the Roman Empire was tested, but the confidence never wavered despite manifestations of separatism, such as the Gallic Empire, and barbarian invasions

by Franks, Alemanni, Goths and Marcomanni[1] (Naerebout and Singor 1995, 358-359). For at AD 284 a thorough reformation and a solid political power was accomplished by Diocletian (AD 284-305) with the erection of the Tetrarchy. This four-emperor system of two *Augusti* and two *Caesari* successfully reorganised the administrative and military establishment of the Roman Empire (Lamarcq and Rogge 1996, 99-100). In the final two decennia of the 3rd century the internal order and imperial power was restored, as well as the frontier defences.

The reformations of Diocletian were continued by Constantine (AD 306-337) The policy can be summarised as: more soldiers, more bureaucracy and more taxation (Naerebout and Singor 1995, 360). The provinces were divided into smaller units and the army was separated into a standing frontier army or *limitanei* and a mobile field army or *comitatenses*. As a result, Gaul became increasingly militarised in the 4th century with the Rhine frontier, the Saxon shore defences or Litus Saxonicum, and the roadside defences with the construction of small forts or *burgi*, such as on the road from Boulogne to Cologne (Nouwen 2006, 40). In addition to political stability and military power, Constantine also introduced the golden *solidus* to revive the monetary economy and played a crucial role in the rise of Christianity (Naerebout and Singor 1995, 361).

It is after this restauration of Roman power and stability by Constantine that the disintegration of the Roman Empire and demise of the Roman West is placed. For the second half of the 4th century, we can name Julian and Valentinian as two important emperors in restoring balance in Gaul by military interventions, on which Ammianus informs us.

Towards the 5th century, the 'Germanisation' of the army in Gaul increased and the pressure from barbaric forces rose once again until 'foreign' officers were defending Roman provinces against barbaric invasions (Nouwen 2006, 40-42). In AD 395 the Roman Empire was formally divided into east and west, after which the Roman West did not last long (Naerebout and Singor 1995, 363). In AD 406 a large coalition of barbarians breached the Rhine and flooded large parts of Gaul. The Roman forces were not able to stop them and in AD 410 Alaric sacked Rome.

[1] These barbarian groups were dynamic tribal confederations consisting of Germanic people from different origins. For an informative overview on this, see Halsall 2007.

From this point on, the Roman troops were withdrawn from Northern Gaul and it was left to the Franks who maintained the former Roman province over the course of the 5th century. The power of the Franks grew gradually under Childeric and by the time of Clovis a new state was formed and the Roman West had fallen (Nouwen 2006, 42-43).

This is the general outline of the traditional historical narrative from the viewpoint of (Northern) Gaul. Not many contemporary written sources are available to inform us on the life in this province in the 4th and 5th century. The work of Ammianus is one of the best-known written sources available to us that consider life in 4th century Northern Gaul. Additional sources that can be used to study the Late Roman period of Northen Gaul include the *Notitia Dignitatum*, the *Vita Probi* (see 4.4.2.1) and the *Panegyrici Latini*. Other historical sources we can also mention are the *Tabula Peutingeriana*, a Medieval copy of a Late Roman map, and the *Historia Francorum* of Gregory of Tours, which is a 6th century recount on the origin of the Franks.

The most important historical influence on Late Roman archaeology derives from Ammianus' History and the notions of decline put forth by Gibbon's *Decline and Fall of the Roman Empire* (1776). These two elements came together in what was a predominantly negative image of Late Roman Northern Gaul as often used by modern day scholars.

As we shall see later on, the Late Roman archaeological record has been guided by this historical narrative into reconstructing a time of decline, despair and disintegration of the Western Roman Empire. Evidently, the situation over the course of nearly two centuries was not so black and white and more events than mere violent encounters between Roman and *barbarians* were at stake. The study presented here will approach the archaeological record of Northern Gaul between the 3rd and the 5th century to explore the social and cultural changes that resulted from changes in Roman communities and the interaction with the Germanic groups present in the region by investigating the material culture that reflected these different aspects of the Late Roman society.

1.2 Situating the research subject

1.2.1 Late Roman archaeology in the 20th century

The Late Roman period in the Low Countries is still largely unknown compared to the Early and Mid-Roman period. Not so much due to a general lack of interest, but rather as a result of the research performed in the 20th century. Scholars long preferred an ethnic interpretation to look at the evidence with a rather normative concept of culture and an uncritical use of written sources. Their main effort was directed into mapping tribes by defining specific categories of material culture and linking these with historically documented migrations. When material culture of the alleged Germanic tribes was found, the subsequent research was orientated towards the legal and social status of these immigrants. Of course, this is a valid field to research, but unfortunately scholars tended to use a binary approach to the subject by putting two elements of society opposite to each other, as if they were extremes that had very limited interaction, such as Roman versus Germanic/Barbarian, or Christian versus Pagan.

All of this was set in a frame of mind that regarded the 3rd and 4th century as a prelude for the fall of the Roman West and regarded the 'Germanisation' of Gaul as a decline in the imperial strength of the Roman Empire. So the concluded picture of Late Roman society in the north of Gaul became a story of abandonment and crisis. Starting in the 3rd century, the area that is currently referred to as the Low Countries was considered the scenery for multiple barbaric invasions, which resulted in devastation, chaos and a complete abandonment of the countryside (Lamarcq and Rogge 1997, 59-93; Nouwen 2006 35-39). This coincided with a political and economic instable situation in the Roman North. The general debate on the barbaric invasions centred around causality vs. consequence.

This situation was presumed to have led to an intensified military landscape in the 4th century with large and small forts along the coast and roads. The cities and central places that survived had a decreased habitation area and suffered a severe drop in population. Besides sporadic new Germanic settlements in the late 4th and early 5th century, it was not until the start of the Merovingian period in the late 5th century that the region was considered to have been 'revived' to a certain extent.

Recent debates have taken up a differentiation on the view of the end of the Roman West (for discussion see Ward-Perkins 2006; Christie 2011; Esmonde Cleary 2013). Some

scholars argue that the concept of the 'fall' of an empire is outdated and that we should think in concepts of transition or change (following Brown 1971). Scholars who argue that the Roman West has fallen are divided by their view on causality. Some argue the external factor, where the Germanic invasions are the main cause (for instance scholars such as Ward-Perkins, Heather, Halsall), others argue internal peril for the downfall of the Roman West, such as political and economic crises. Others again combine a mixture of both arguments, where the invasions were either the cause or the consequence of these internal crises (e.g. Esmonde Cleary 2013; Gerrard 2013).

1.2.2 Decline and Fall? A research project

From this recent debate, the Decline and Fall project was created in order to address the lack in synthesising studies for the Low Countries. The current study is a product of that project. The general aims of the project are briefly discussed, since they influenced the choices that were made here.

The main focus of the project was placed on the social and cultural changes in the Late Roman period, and subsequently how archaeology could assist in gaining knowledge on the transformation that took place in Northern Gaul between AD 270 and 450. The current archaeological directions based on insights from the social sciences, such as the work of Bourdieu (1977; 1990), offer new perspectives for studying change in tradition and immigration.

The first aim was to establish a broader understanding of the transformation processes of the rural settlement evolution from the 2nd to the 5th century in which newly excavated sites and published settlements were analysed in search of patterns of continuity, discontinuity, depopulation and repopulation.

Second, when repopulation or discontinuity was established, the material culture of the new settlers was studied as a product of the 'structured ways of doing' embedded in daily practise, following the Bourdieu school of thought. The most promising material culture categories consist of household pottery, dress accessories and dwelling construction techniques, as will be explained further on. The approach of the *chaînes opératoires* provides valuable insights into the transformation processes at work, which allow for an assessment of the interaction between local and immigrated communities, i.e. Gallo-Roman and Germanic communities. The term 'Germanic' is used here as an indicator towards the geographical origin of these groups or individuals, generally

referring to the areas north of the Rhine, and does not signify a constrictive ethnic label in any sense. No attempt was made to assign tribal or ethnic labels or identities derived from the written sources to a specific material culture.

A final objective was to explore the transformation of the material culture that belonged to the so-called 'first-generation' settlers over time in order to take the current discussion beyond certain fixed dichotomies. This approach considers the possibility of a hybrid cultural package used by descendants of both immigrant and local provincial-Roman communities, which can be used to clarify processes that transformed the use and significance of material culture.

In general, the research in the frame of the 'Decline and Fall?' project focussed on the social use and transformations of material culture, in both settlement and funerary contexts, rather than building on presupposed notions of ethnic groups and a static material culture. This formulated into the central research question:

How does the material evidence from settlements and cemeteries in the Southern Netherlands and Flanders inform us about social and cultural transformations in the 3rd, 4th, and 5th centuries?

1.2.3 Research parameters

Specifically in this dissertation, the research question was pursued by an assessment of Late Roman habitation and analyses of different types of material culture that fall within the parameters set by the project. The research area consists of northern Belgium (Flanders) and the southern Netherlands. In terms of the Roman world: the region of Northern Gaul comprising parts of the Late Roman provinces *Belgica Secunda* and *Germania Secunda*, which are located between the North Sea and the river Rhine, north of the Roman road Boulogne – Cologne. This is the most northern part of the Roman Empire on the continent and was considered the end of the civilised world.

The selected material culture from this entire region has been studied and compared with archaeological finds from the surrounding areas consisting of the northern Netherlands, west Germany and northern France. The test-case of Flanders is geographically more compact and is concentrated on the transection from the coastal plain over the sandy soils, containing part of the Scheldt basin, reaching as far as the loamy plateau in the east.

The view on the Late Roman chronology applied here ranges from the 3rd to 5th century, starting ca. AD 270 and ending ca. AD 450, with some selective comparative cross-overs

to the earlier 3rd and later 5th century. The end date was chosen to extend beyond the traditional AD 410 date based on the notion that the Late Roman society did not suddenly end – on a social and a cultural level – with the withdrawal of the Roman troops.

1.3 Structure of the thesis

This study is divided into four parts. Part one is a general introduction on the research frame in which this study is set. Part two considers the Late Roman archaeological record from Flanders. Part three features three material culture case studies. And part four formulates answers to the research questions posed in this study.

PART 1: INTRODUCTION

The first part consists of three chapters that consider the general research conditions and framework on which this study is based.

Chapter 1 (*Introduction*) provides a general introduction on the research area, chronology and framework in the joined research project 'Decline and Fall?' (Ghent University – Free University Amsterdam).

Chapter 2 (*Conceptual framework*) elaborates on the theoretical discourse that influenced the methodological approach and the selection of case studies, as well as the interpretation of the results.

Chapter 3 (*Research aim, objectives and strategy*) visits the objectives, research questions and applied strategy of this dissertation.

PART 2: A NEW LATE ROMAN LANDSCAPE FOR FLANDERS

Chapter 4 (*Late Roman archaeology in Flanders*) delivers an overview of the archaeological record in Flanders for the Late Roman period to determine the current state of knowledge by compiling an inventory of Late Roman sites, finds and radiocarbon dates into a GIS database. This database is used to explore geographical, chronological and occupation patterns. The test-case area is divided according to the landscape, in which all reliable sites and finds are compiled into an assessment of the Late Roman occupation. Furthermore, the collected data provides a contextual framework to investigate spatial and chronological changes in the selected material culture. Finally, some considerations

concerning recognisability and the uncritical persistence of paradigms are given, to conclude with an overview of the updated knowledge on the Late Roman period from the Flemish archaeological record. The inventory and lists on the Flemish archaeological record are enclosed in the appendix.

PART 3: ASPECTCS OF LATE ROMAN SOCIETY IN NORTHERN GAUL

The third part presents the material culture case studies that were used to investigate the social and cultural changes in the Late Roman period. First, a methodological introduction is given on the approach towards material culture and the analytical techniques that have been applied. This is followed by the consideration of three material culture studies – two types of pottery and one type of metal artefact – for the general region of Northern Gaul between the 3rd and the 5th century.

Chapter 5 (*Methodology for the material culture studies*) provides the methodology concerning material culture and the applied analytical techniques. For the pottery case studies, ceramic petrography is used to investigate matters of provenance and technology from fabric composition. For the metal artefacts, handheld X-ray fluorescence provides insights on the metal alloy composition which informs us about production and technology.

Chapter 6 (*Traditions and changes in Late Roman Handmade pottery*) discusses the first case study and focusses on Late Roman handmade pottery. After a state of research, an adjustment on the current classification of fabrics is given, followed by an assessment of differences in provenance and technology. An interregional comparison considers petrographic results from Belgium, the Netherlands, Germany and France. The results of the fabrics are combined with exploring patterns in style, distribution and chronology in order to come to a characterisation of the Late Roman handmade pottery fabrics present in Northern Gaul and are related to matters of tradition, identity and interaction.

Chapter 7 (*Late Roman terra nigra foot-vessels: "a Germanic idea in a Roman body?"*) provides the second case study which examines the production and consumption of the Late Roman terra nigra foot-vessels from Northern Gaul and the Rhine area. This chapter is based on the international study and the corresponding article (in prep.). First, the typological obscurity surrounding this pottery type is addressed, followed by the new distribution resulting from the compiled database on finds from Germany, the Netherlands, Belgium and France. Second, in addition to an overview in the fabric variety, the petrographic results are complemented with geochemical results from the German

research. These results provide new insights in the production and consumption of this ware and can be related to their sociocultural context.

Chapter 8 (*Changing display of status: rise of the military elite based on evidence from the Low Countries crossbow brooches*) considers the final case study considering the crossbow brooches. A review of the long research history on this object type shapes the general research questions for the cultural biography of this artefact. Archaeological, illustrative and written sources are combined with a stylistic evaluation, as well as handheld XRF and dimensional analyses in order to explore the changes in production to consumption of these metal finds from Belgium and the Netherlands. This chapter contains two parts that have been the basis for two separate publications on the cultural biography and the analytical results (respectively in press. and submitted), which have been selectively adjusted to accommodate the coherent structure of the chapter.

PART 4: SOCIAL AND CULTURAL CHANGES IN LATE ROMAN NORTHERN GAUL

Chapter 9 (*Interpretation: Towards a new Late Roman archaeology*) combines the results of the test-case and the case studies. First, an assessment of the representation of the selected material culture for the Late Roman archaeological record of Flanders is provided, as well as a validation for their application to investigate social and cultural changes in the Late Roman society. Second, the major implications regarding the central research question of social and cultural dynamics are given for each case study. Third, the final conclusions on the major processes of change for Late Roman Northern Gaul are provided.

Finally, chapter 10 (*Conclusion*) consists of the general conclusion and some thoughts for future research.

2
Conceptual framework

This chapter discusses the general conceptual framework in which this research is set and which determined the choices made in selecting the case studies in order to answer the central research question.[2] First the distinction between Late Roman and Late Antiquity and their affinity towards models of 'decline and fall' and transformation are considered. Second the concepts of migration, tradition and identity are approached in their relation to archaeology and their relevance in the current study.

2.1 Concepts of Late Roman decline and Late Antique transformation

The debate between a decline or a transformation approach to formulate the end of the Roman era and the transition to the Medieval times has been fierce and longstanding. Since Gibbon's *The History of the Decline and fall of the Roman Empire* (1776-1789), the demise of the Roman Empire in the Late Roman period or in Late Antiquity has been a well-regarded classical debate.

[2] More specific theories and methods applied in this dissertation are discussed in the relevant sections of the case studies in order to maintain the internal coherence.

Ward-Perkins (2006, 1-5) refers to the traditional sentiment of the 'decline and fall' as the catastrophic view and phrases it as follows:

> '[...] a high point of human achievement, the civilization of Greece and Rome, was destroyed in the West by hostile invasions during the fifth century. Invaders, whom the Romans called quite simply 'the barbarians' and whom modern scholars have termed more sympathetically 'the Germanic peoples', crossed into the empire of the Rhine and Danube frontiers, beginning a process that was to lead to the dissolution not only of the Roman political structure, but also of the Roman way of life.' (Ward-Perkins 2006, 1)

In contrast to the destructive force of the barbarian invasions as the main instigator of the fall of Rome, the accommodating view (Ward-Perkins 2006, 5-10) argues a more peaceful transformation by which the Germanic migration resulted in altered Western societies. These new societies had adapted to the changing circumstances present from the 3rd century onwards leading to the 'barbarian successor states', as it is called by Pohl, who reformulates Gibbons view as:

> 'A civilised state whose citizens have lost their ambition and military virtues and abandoned the values of public service under the influence of the Church becomes an easy prey for the raw strength and courage of the barbarians.' (Pohl 1997, 33)

In general, European historiography has focused on the barbarians and the rise of Christianity as the coalition of decline and fall of the Roman Empire. Usually, there is a distinctive focus on either the collapse of the political structure or on the social- and cultural-historical changes in the Late Roman world (Ando 2008, 31-32). Often, this distinction is driven too far and over-emphasises one aspect while neglecting the other. For instance, the narrative of a peaceful transition has been criticised to ignore the violent aspects of the Roman-Germanic relation in general (Ward-Perkins 2006). Moreover, some scholars even overturned the traditional roles by which the barbarians became the representation of a new strength in a declining and decadent society. Which was no more than a shadow of the former strength of the Roman Empire (Pohl 1997).

These general developments led scholars away from the traditional ideas towards the more slower process of transformation and in which way aspects of the Roman world survived after its fall (Halsall 2007, 19). The broadening of the chronological scope necessary to capture such transformation led to the development of Late Antiquity as a separate discipline. Brown launched the application of the field of Late Antiquity as a way

to understand social and cultural change with the focus on transformation, breaking the tradition of the use of the decline and fall notion as a complete explanatory model shaped by the end of the Roman West for the entire Roman world (Brown 1971, 7-8). Although, as he indicates himself, the Late Antiquity narrative 'gravitated' towards the eastern Mediterranean, which is still often the case.

> 'I do not imagine that a reader can be so untouched by the idea of classical Greece and Rome or so indifferent to the influence of Christianity, as not to wish to come to some judgement on the Late Antique world that saw the radical transformation of the one and the victory over classical paganism of the other.' (Brown 1971, 8)

This phrase sums up the notion of the classical perspective on the main changes between the 2nd and 9th century on which most scholars can agree. First, the collapse of the overarching structure of the Roman West, and second, the importance of the role of Christianity in changing the European world (Ando 2008, 31-32). The transformative narratives from Late Antiquity often focusses on the latter and is usually centred on the (eastern) Mediterranean, which has led to the attempt to try and correct a previous bias with a new one. The promotion as Late Antiquity as the new way forward has received the same critique as the idea of decline, i.e. forcing a model for a part of the Roman society on the entire Roman world. In this case, to force a model of transformation on the end of the Roman West leads to the overemphasis of the peaceful accommodation and the downplaying of the violence and warfare (Ward-Perkins 2006, 170-171). Nonetheless, the introduction of Late Antiquity has forced scholars to rethink the end of the Roman West. Not only from a historian's angle, in which Peter Heather (e.g. 2005, 2009) is very influential, but also from an archaeological perspective. Christie (2011) has stated, quite correctly, that archaeologists are much involved in rethinking the Late Roman, Late Antique and early Medieval period. Especially given the large increase in archaeological data from the last decades, it can be seen as the responsibility of the archaeologist to contribute to key aspects of the debate:

> 'Their [archaeologists] role should indeed be prominent in uncovering changes in lifestyles, buildings, spaces, landscapes and economies across the time span, and in giving clearer images to the different provincial sequences and to the new peoples and barbarians that begin to take the stage.' (Christie 2011, 6)

He concluded that from the archaeological record alone, i.e. without incorporating the historical narratives in the interpretation of the data, the aspect of decline is

unmistakably present in the Roman West. The settlement evidence points to more inward looking societies with more regional identities, although a stronger urban resilience can be argued through the influence of the Church. Additionally, he concludes the essential nature of combining historical and archaeological approaches in successfully understanding the fall of the Western Roman Empire (Christie 2011, 229-231).

An increasing number of studies start to avoid a singular explanatory model and extreme positions in either the 'decline and fall' or the 'transformation' discussion. The growing multidisciplinary approach to the post-AD 200 Roman world is moving away from an incoherent amalgam of disciplinary-specific studies, and into an integrated approach that recognises the possibilities and limits of each discipline. The application of terms as 'decline' and 'transformation' have become a matter of scale, focus and perspective in which these concepts are no longer mutually exclusive, such as in the works of Esmonde Cleary (2013), Gerrard (2013) and Rogers (2011).

For the current study, the term of Late Roman is applied, not to imply a decline approach or refute processes of transformation, but only as a chronological indicator for the Roman West and more in particular Northern Gaul. As mentioned earlier, the delineation of Late Roman is set between ca. AD 270 and 450, with additional transgressions of these boundaries when it deems necessary to frame the development of occupation or understand changes or stasis in material culture. The term Late Antiquity is not applied further, given that the 6th to 9th centuries fall under the early Middle Ages for the studied part of Europe.

Next to the decline and transformation debate, the difference between Late Roman and Late Antiquity is a more relevant distinction to make in our current case. Many more labels exist to name the transitional period between the High Empire and the Medieval kingdoms, but these two have become intertwined with the different views on how to understand this period of time. The notion of decline and fall has become associated with the Late Roman designation, whereas Late Antiquity is seen as the representative of transformation. Although, their basic distinction in no other than a chronological division, this resulted in the preferential use of Late Roman (3rd to 5th century) for the Roman West and Late Antiquity (varying between the 2nd to 9th century) for the Mediterranean and Eastern Empire. Both, however, have often been regarded in a negative way that understood the collapse of Rome as the introduction into a period of cultural stagnation and religious superstition (Ando 2008, 32). This negative attitude for the Late Roman West (such as Gaul, Britain and Hispania) is caused by the long preference

by scholars for the positive process of Romanisation coinciding with the negative historical narratives for the end of the Roman West and the apparent qualitative decline in material culture. In the last decades, a countermove against this negativity was launched inspired by the transformation from Late Antiquity and led to an increased focus on aspects of continuity in a socio-cultural framework. Although studying continuity requires a shift in focus, it is acknowledged that ignoring the demise of the Roman political structure and denying the violent aspects of the Late Roman period just for the sake of disproving the general notion of decline, is foolish.

2.2 Notions of migration, tradition and identity

2.2.1 Archaeology and migration

During the Roman period, migration happened. It cannot be denied, although it has proven very difficult to confirm or differentiate on the exact nature and impact of migration via archaeology. We have come a long way from regarding migration in terms of 'peoples' or cultural history, where a cluster of pots equalled to the distinction of an ethnic group, and the main processes of migration were seen as invasions or population replacement (Heather 2015, 1-2). Nevertheless, migration has always been, and still remains, a difficult issue in archaeology:

> 'Whereas in continental European archaeology, at least in its German form, migration is omnipresent as an explanatory model for the spatial distribution of archaeological finds, it is only as an axiomatic precondition of the phenomena observed. Migration itself is seen neither as being in need of explanation and thus as a research topic in its own right nor as a potential explanation for the manifestations of cultural change.' (Burmeister 2000, 539)

As Burmeister summarises here, the archaeology of migration was found wanting in Europe at the end of the 20th century, especially in comparison with other social sciences that saw an increased important role in scientific investigations from the 1960's on. In contrast, the inadequate methodological and theoretical basis of the traditional approach to migration in archaeology, even led the New Archaeology to reject it as an explanatory

concept and banned the research of migration via archaeology altogether (Burmeister 2000, 539; Hakenbeck 2008, 9).[3] The roots of this reaction can be found in the aversion created by the use of migration in archaeology to create nation's origin myths. However renewed interest for migration was sparked in archaeology, partly due to the development and use of isotope analyses and DNA research which provides a bottom-up evidence-driven approach (Hakenbeck 2008, 19; Fernández-Götz 2016, 1). This approach has been seen as possessing the potential to narrow the gap between large-scale migration and small-scale mobility of individuals (for instance see the work of Hamerow (1994b; 1997; 2011) or Eckardt (2011; 2014; 2015) for analytical approaches to the migration and mobility in the Late Roman and early Medieval period).

Previous attempts to find proof of migration through archaeological evidence were based on the identification of groups by means of a number of specific traits in material culture. This has been argued to be a static understanding of material culture based on the spatial distribution of cultural traits in relation to migratory ethnic groups, with no regard for its semiotic value and neglecting the different mechanisms of dispersal. By now, archaeological proof of ethnicity through material culture is received sceptically and perceived as underestimating the connection between social mobility and ethnic change (Burmeister 2000, 540).

Migration is part of the concept of mobility and can take many forms: it can occur on long or relative short distances; it can be one-way or contain return migration, with circular or tethered motions e.g. transhumance and seasonally depended societies; or it can be seen as a chain migration or career migration (Anthony 1997; Halsall 2007, 417-418) Additionally, four migratory phases have been identified. First a contact or exploration phase, followed by the migratory movement and the actual establishment in the immigrated area, and finally the reverse current phase (Prien 2005). In short, migration can occur under many circumstances. There are usually a number of 'push' and 'pull' factors influencing the cause, scale and direction of the migration, but they have a few things in common that apply to our chronological and societal frame: they are almost never only one-way, they are no 'flood' migrations overrunning the land and replacing a complete population, and they are usually preceded by small groups or 'scouts' that relay information back to the region of origin. The latter results in a limited number of specific

[3] For an overview on the positions and approaches to migration in archaeology over time, see Hakenbeck 2008.

routes and entry points. Migration as an archaeological concept has long been perceived only as mass migrations in which 'waves' of foreign invaders overrun complete territories, or as a particularistic irregular occurrence. In fact, the process of migration is more accurately imagined as an infiltration embedded in long term processes occurring over multiple generations and centuries (Burmeister 2000, 540).

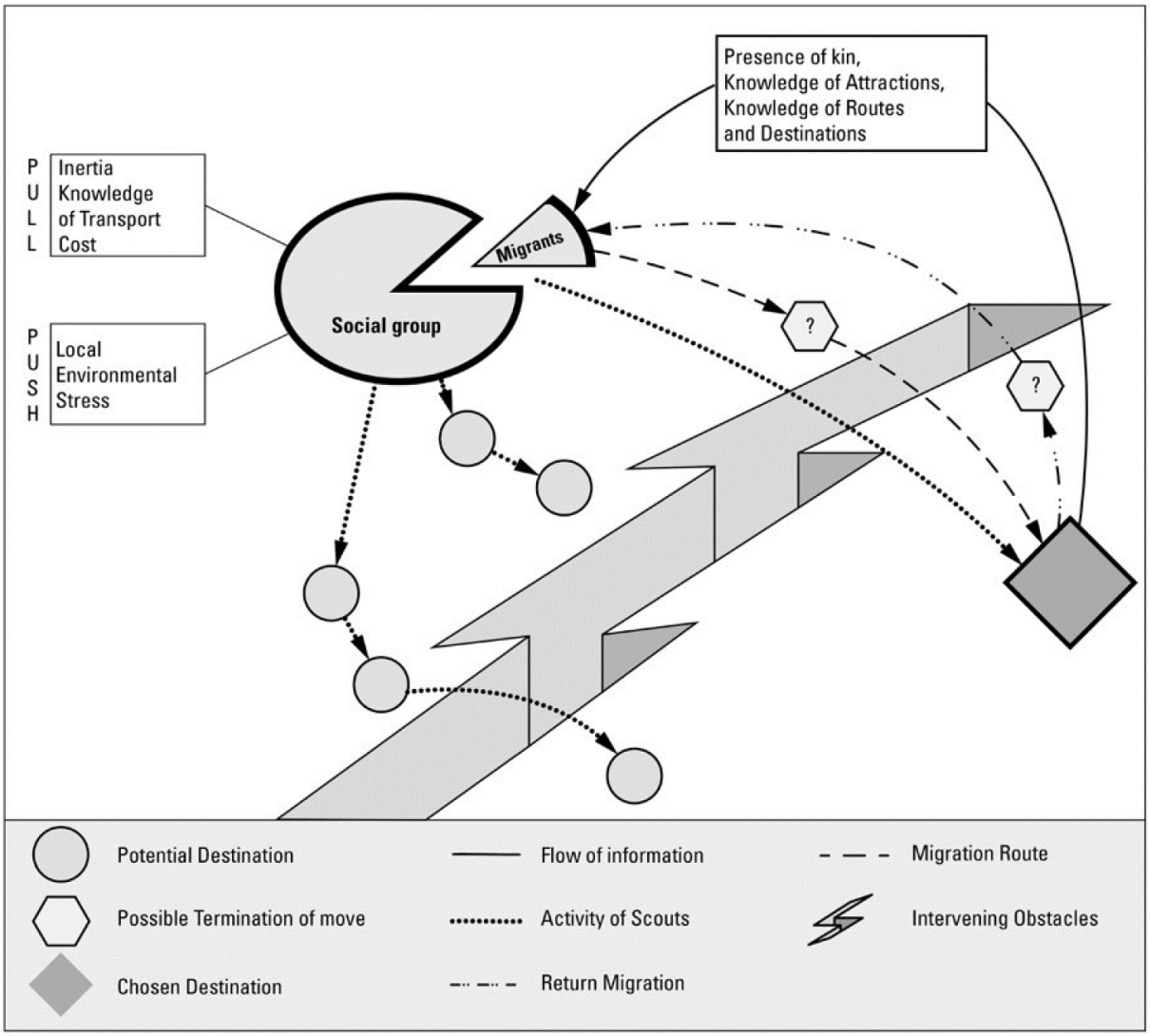


Figure 1 Schematic representation of the general aspects of the migratory process (Fernández-Götz 2014, 2, fig. 1 modified from Anthony 1990, fig. 1).

The way forward in actually proving migration in archaeology by using material culture lies in what Burmeister (2000, 542) calls 'the culture of the private'. Based on the habitus of Bourdieu (1977), he makes a distinction in his model between two spheres of social life: an external domain, or public sphere, and an internal domain, or private sphere. The external domain is described as a zone of contact in which the social and economic intersect with the environmental and confront the habitus with change. In this

sphere lies the adaptation, whereas the private sphere stands for tradition, persistence and invariability:

> 'If economic and social conditions deviate from those that created the habitus and the new conditions cannot be adjusted to the cultural patterns, then the practices of the immigrant group and thus also their habitus will have to be modified. [...] In the internal domain, however, the conditions that determine practices – such as the social system of the family and household and the organization of the private life – are not directly connected to external conditions, and the habitus is very likely to persist.' (Burmeister 2000, 542).

Based on evidence from the European settlers in North America he states that the best chance of finding proof for migration lies in the internal domain. The archaeologist should focus on material culture that has little effect on outsiders, lack social significance and cannot be adopted for prestige or fashion. Additionally, more emphasis should be placed on the production techniques than the formal traits, given their stronger connection with the habitus (Burmeister 2000, 553).

2.2.2 Habitus and material culture

In order to understand the social practices and their significance in the use of material culture to study migration and mobility, we need to elaborate more on the individual and their place in society. The application of sociological models in archaeology has increased recently in European continental archaeology and the notions of habitus and agency have become common traits in the approach to material culture. The concept of habitus have spread from Bourdieu's *An outline in theory of practice* (1977) and *The logic of practice* (1990), and for agency it was Giddens' *The construction of society: outline of a theory of construction* (1984) that was most influential. The habitus can be seen as the existing socio-cultural structure as it has been shaped by traditions that arose from practice in which the social is experienced as a natural state (Bourdieu 1977). In this view, a person's actions and interactions are shaped by their practices that create and uphold social structures. This structured approach to society tends to promote conservationism in society and determinism of the individual. That is where agency comes into play.

> 'Agency refers not to the intentions people have in doing things but to their capability of doing these things in the first place.' (Giddens 1984, 9)

Simply put, agency represents the free will and possibility of people to act beyond the structure imposed on them by society, both on a conscious and unconscious level. These actions also have a place in Bourdieu's theories in the 'logic of common practice' and the circumstances that influence the habitus, which are determined by field and capital. The field can be understood as the social space in which interactions, transactions and events occurred (Thomson 2008, 67). The concept of capital can briefly be described as the properties of a person that enable them to move in the field on an economic (e.g. property, money), cultural (e.g. knowledge, education) and social (e.g. network) level. Additionally, a symbolic capital represents the less tangible traits of an individual, such as prestige or reputation (Herremans 2013, 34-35 after Bourdieu 1986).

These concepts of habitus, capital and field make up the theory of practice that investigates the social processes that shape a society, which are intrinsically connected to the identity of the individuals of that society and are reflected in the material culture that is the result of these social processes and interactions in the social space. Or, material culture can be seen as material practice, given that the production and manipulation of material culture are socially significant. The manifestations of the social practice embedded in the creation process of material culture is referred to as 'style' in the *chaîne opératoire* approach and can be seen as the transference of the habitus into actions which indicate the position of a person in their social structure. Or seen from a bottom-up approach: the analyses of style as an expression of variability in material culture can reveal information on the habitus and evaluate how the habitus was shaped by material practice which either supported the regeneration or affected the change of social systems (Shennan 1994, 17-21; De Clercq 2009, 29).

It is this relation between *social processes*, *material culture* and *identity* that are key aspects in this thesis. Briefly put, social practice or traditions in society are created by social processes that are embedded in a cultural setting. From ethno-archaeological and anthropological studies it has become clear that the way in which material culture is made is as much an expression of social or cultural identity as the physical aspects of objects. It is this principle, derived from the theories of Bourdieu, that Burmeister uses to distinguish between an external and internal domain in society. The objects made in the internal domain are products of tradition, whereas the external domain creates objects that serve a functional or symbolic need or purpose in society and is recognisable for members of the same social or cultural group (also referred to as 'design theory': Caple 2006, 12-13). As such, material culture is part of and shapes the human experience.

Relevant to our case is that objects are not only reflections of the social practice, but can also be seen as active and autonomous products of society (Harvey 2009, 1-8), constructively defining and redefining the identity of their creators and owners.

2.2.3 Identity

Identity has a longstanding position in archaeological questions and theory (e.g. Shennan 1994; Meskell and Preucel 2004; Insoll 2007), and has been closely connected with exploring ethnicity in Roman studies (e.g. Woolf 1995; Roymans 2004) (on archaeology and ethnicity in general see: Jones 1997). Similar to archaeology and migration, it has been heavily debated to what extent archaeology can be used to reconstruct matters of identity. Because connecting immaterial values to material culture is very difficult, it needs to be approached in a careful manner. As stated earlier, in much of the 20th century research the preferred approach consisted of attaching ethnicity to material culture. In a simplified way, this led to limiting social and cultural dynamics by underestimating the individual actor and reconstructing a complex matter by only looking at group interactions. For our period and region of focus, this approach has been used to connect archaeological finds with the historically attested mass migrations. This resulted in a circular reasoning by using their self-designated evidence to prove these migrations. By now we also know that the migrated Germanic groups were poly-ethnic amalgams (Burmeister 2000, 540), which makes it even harder to claim an ethnic origin to groups and the material culture.

Identity has proven to be more applicable than ethnicity in archaeological studies. Additionally, it allows an approach that can vary between the individual and the social group, bridging the gap between the notions of material culture, social practice and migration discussed above. Material culture is actively used to express identity on different scales. It expresses social and cultural identity markers – such as gender, age, class, religion, family, provenance and even ethnicity – which are embedded in the *chaîne opératoire* and are determined by context. Considered from the migration point of view, expressing identity becomes more relevant in zones of interaction (such as the frontier zone) or a multicultural society (which is more the case for urban settlements or military forts) in order to claim your membership to a specific group or to distinguish yourself from others (Burmeister 2000, 546). Nevertheless, identity is considered as a dynamic and complex concept because of its multifaceted nature, its interconnectivity and relativity:

identity is interwoven with almost every aspect of a person's life and changes depending on the circumstances.

As indicated, identity can be approached from many angles in archaeology of which the most profound fall under social identity (e.g. Hodder, Meskell and Preucel 2004; Meskell and Preucel 2008), cultural identity (e.g. Shennan 1994; Stark, Bowser and Horne 2008) and ethnic identity (e.g. Jones 1997; Roymans 2004; Derks and Roymans 2009). The relationship between different types of identities handled by archaeology and the actual relation between material culture and a person, community or society are two different things. The former represents approaches and corresponding theoretical and methodological frameworks towards archaeological questions, whereas the latter represents the material and immaterial bond between humans and material culture that cannot be labelled so neatly. A symbolic value given to an object is not or social, or cultural, or ethnic, nor is it a stable value that has the same meaning in every context to each person. Therefore, we have chosen here for a more direct application in which the relevant aspect of identity concerning the question at hand is labelled and defined. For instance, the notion of cultural identity is preferred when there is a distinction between communities or groups from different cultural or ethnic backgrounds within the same societal structure, such as is the case for the indigenous Gallo-Roman population and the immigrated Germanic groups. When this distinction has no added value in the researched aspect of that society or cannot be made, the term of social identity is given precedence, for instance in the case of interaction between different groups from the military establishment or the adoption of military styles by civilians in the pursuit of prestige. The choice not to attempt a reconstruction of the historically attested ethnicity with the Germanic material culture resulted in the consideration of ethnic identity only as part of the cultural 'package' of a group or community and will not be handled specifically.

3
Research aim, objectives and strategy

This chapter describes the aims and objectives of this dissertation as well as the reasoning behind the selection of the different case studies in this research.

3.1 Aim and objectives

The main objective of this thesis is to analyse the material culture from the area of Northern Gaul in order to answer questions on social and cultural change in the Late Roman period, as formulated in the research question. A broader interpretation of the archaeological record and material culture is obtained by combining different archaeological methods with analytical techniques, anthropological models and historical sources.

First, the habitation patterns between the 3rd and the 5th century are explored by investigating patterns in the habitation history of settlements and considering the available chronological evidence. The study of (dis)continuity and re- or depopulation in rural settlements and cemeteries will occur on a site and regional level. Additionally, identifying the material culture in relation to the dwelling structures can provide insights in the nature of the habitation and the integration of the rural settlements in the economic network (surplus to self-sufficiency).

Second, in case of discontinuity or repopulation, material culture can be examined to assess cultural-specific traditions or styles in *chaîne opératoire*, which can provide tools for assessing transformations. Mainly the focus will lie on household pottery, dress

accessories and – to a lesser extent – house forms (see further). This notion is based on a working hypothesis that migration can be recognised archaeologically by their first generation material culture, i.e. objects that people brought with them and building techniques for dwellings and objects as taught according to tradition by their kin or community and hence closely connected to the habitus (Burmeister 2000) . In order to identify this first generation material, analytical techniques revealing details on provenance and technology can be used. Furthermore, when these results are considered in a *chaîne opératoire* approach, which provides a cultural biography for the artefacts from production to consumption, this can reveal much new information on the change in social use and the transformation of the Late Roman society in general.
Based on the same reasoning given for the immigrant material, local traditions can be established as well, which provide a comparative baseline to assess change or stasis in local provincial-Roman material culture within Northern Gaul, as well as potentially identifying a hybridisation of material culture. The objective of this third aspect is meant to take the discussion beyond mere cultural opposites, such as Roman-Germanic, but also to explore transformation processes in the use and significance in material culture.

3.2 Research strategy

The set-up of this research comprises the application of both traditional archaeological methods and new ways to approach the archaeological data. Classical tools such as classification, typology and distribution provided the basis for each case study, which was explored further by the use of analytical techniques and approaches. Although every aspect used in this research is an established way of investigating material culture in archaeology, the combination of many different methods and techniques not only provide new insights in the understanding of Late Roman material culture and occupation, but also contributes to the development of new ways to combine models, materials and analyses.

3.2.1 A test-case for contextualisation and occupation

To provide a detailed contextual framework to interpret the material culture, the archaeological record of Flanders is reviewed in search for the Late Roman period. Although Flanders is a modern day political structure, its use as a geographical region to investigate Late Roman archaeology is justified on a number of different levels.

First, Late Roman archaeology in Flanders has been limited to micro-regional studies and remained mainly on a site-level scale (see 4.1.1). The lack of synthesis studies has caused a knowledge gap for archaeologists working in and outside these boundaries, resulting in the exclusion of the Flemish territories in pan-regional archaeological and historical studies of the Late Roman world.

Second, the area of Flanders provides a geographically varied transect between the coastal plain in the west and the loamy plateau in the east, of which the largest part consists of sandy soils and part of the Scheldt basin with its tributaries. These elements represent the bulk of the geographical variation in the Low Countries and supports the validity of Flanders as a test-case to explore the relation between landscape, settlement types and habitational patterns.

Third, the growth in commercial archaeology in Flanders has created a need for coherent synthesis studies within present day boundaries that can be used as a reference work in order to identify and contextualise new excavations and finds. The concise overview delivered here (Chapter 4) provides a quick tool that can be used to raise recognisability and distribute new interpretative models that are not readily available for commercial archaeology.

Finally, by choosing a present day structure as a geographical region, an assessment can be made of the potential of the existing archaeological databases and systems (e.g. CAI, GRMT-TMS, ^{14}C KIK), designed to cope with the increased archaeological data of the past two decade that, in contrast, can also reveal potential flaws in the systems or difficulties in the combined application of different systems.

In conclusion, it can be stressed that the test-case of Flanders is mainly intended as a general compilation of the current state of research in order to provide a contextual basis to interpret the material culture. Nevertheless, the gathered data will be evaluated in its own right to explore changes in occupation and patterns of habitation as well as the state of the current research on Late Roman archaeology in Flanders.

3.2.2 Material culture case studies

As mentioned previously (chapter 2), material culture can be used to study different kinds of identity. In the current research, one of the main questions concerns the identity of who was actually living in the northern part of Gaul in the Late Roman period. To answer this question information about the social and cultural identity of the inhabitants is required. Previous studies on cultural identity have shown that there is a distinction in the expression of this identity between the external and internal cultural domain (Burmeister 2000). The material culture used in the external domain is more likely to be similar to the dominating culture of the society, whereas the internal sphere is more likely to resemble traditions of the social unit. For instance, in the case of a migrated family from outside the Roman Empire, this would translate to a (provincial-)Roman material culture in the external sphere, in order to assimilate with the indigenous population. The internal sphere, however, has a higher chance of persistence of the habitus of the immigrated family, and is probable to contain elements that refer to their origin and original traditions. These traditional values are most likely resembled in everyday objects without functional effect on outsiders, with a lack of social significance and items that cannot be adopted as objects of prestige or fashion. In line with this argumentation, simple household pottery has a good chance of resembling these elements.

In contrast, a social identity plays a more important role in the external domain when a person comes into contact with others and feels the need, consciously or unconsciously, to express aspects of their personal and/or group identity. The material culture that has the highest chance to reflect this are things that can be seen or perceived in interaction, such as clothes and accessories. In other words, the most promising objects are those with a definite functional effect on others and with a certain social significance that convey a message and can be used for prestige or claiming membership to a community. In this case, a type of dress accessory originating from the military has been selected because of its definite symbolic value and application as an identifier.

We will briefly review the reasons for selecting the specific category of material culture to inform us on social and cultural changes in Late Roman Northern Gaul.

Late Roman handmade pottery

Two categories of pottery were chosen for study. The first one is Late Roman handmade pottery. This is a complex material category to identify, because of the difficulty to distinguish the Late Roman from the earlier Roman, early Medieval or even Late Iron Age handmade pottery. Consequently, Late Roman handmade ceramics have often been misidentified and misdated.

The general current knowledge on the properties of the Late Roman handmade pottery prior to this study are: a relatively high firing temperature, a fine gravel grade temper, as and the appearance of new types of inclusions (De Paepe and Van Impe 1991). Despite the work of De Clercq (2009), the basic interpretation still given to Roman handmade pottery in many archaeological excavations in the Low Countries is limited to belonging to a rural community or lower social class, as a product of local production with a restricted distribution within the family or local community. Occasionally signs of ethnicity would be assigned to certain decorations or manufacturing methods.

It will be argued in this thesis that Roman handmade pottery possesses more potential. By establishing a local or non-local provenance and/or technology for this pottery, it is possible to gain insight into the traditions that produced them and evaluate the interaction of different social groups by studying the corresponding context. Handmade pottery qualifies as an object of expression of a traditional cultural identity suitable to investigate migration, since it fits the criteria set for identifying material culture belonging to the internal cultural sphere rather well: it needs to have no functional effect on outsiders, has to have a lack of social significance and cannot be adopted as an object of prestige or fashion.

In short, Late Roman handmade pottery is considered as a part of the material culture that resides in the internal domain and can serve as a proxy for social practice and habitus, which can be used as a measure for continuity, migration, interaction and assimilation in rural communities.

Late Roman terra nigra foot-vessels

The second type of pottery chosen are foot-vessels belonging to the Late Roman terra nigra group. The label of Late Roman terra nigra refers to a group of pottery with mainly grey coloured fabrics, in which the label ‘Late Roman’ refers to the chronological aspect and ‘terra nigra’ to the grey coloured fabrics. This is in no way a reference to continuity of the quality ware of the earlier Roman period. Two of the most common types of foot-

vessels will be studied here: the type Chenet 342 (Chenet 1941) and the type Gellep 273/274 (Pirling and Siepen 2006). These forms are generally described as S-profiled beakers or cups on a high foot, with a blue-grey to grey fabric and have been dated between 325 and 450 AD. They have a wide spread covering large parts of the Netherlands, Belgium, France and Germany. Despite their common occurrence, there is still no knowledge about their production sites. Furthermore, it is debated whether these foot-vessels are Roman, Germanic or hybrid in nature.

New insights can be found for this pottery group by assessing the distribution and contextual evidence in combination with possible expressions of provenance in style (i.e. shape, decoration, production process) and indications of production techniques in the composition. All these aspects hold information on their social and cultural significance and provide a good opportunity to study the changing identities in the Late Roman society in Northern Gaul.

Crossbow brooches

In general, dress accessories are ideal to express social identity in multiple aspects such as age, gender, fashion, social rank, status and personal taste. Besides considering cultural identity, it is also possible to take a look at social identity through material culture. Social identity takes place in the external cultural sphere, this can be on an individual, family or group level. Objects related to investigating sociale identity can also be everyday objects, but they need to have a functional effect on outsiders, contain a certain social significance and have to be able to be adopted as objects of prestige or fashion.

The metal dress accessory studied here is the so-called 'crossbow brooch'. It is an object of which the social significance is considered to be known, i.e. the expression of membership to the military and administrative establishment in Late Antiquity. However, when the existing typo-chronological models are closely investigated, a transformation of this type of brooch is noticeable from the 3rd to the 6th century AD. At least two major moments of change are to be seen in the shape of the object itself. Moreover, it is not until the second half of the 4th century that this brooch is depicted or becomes a common part of the burial costume. Regarding that a change in material culture often resembles a change in social perception or significance of an object, it is likely that this dress accessory has a more complex social practice and cultural biography than is considered. The crossbow brooch can form one of the key elements in the study

to the processes surrounding the growing military influence in the official establishment of the Late Roman society.

These four case studies represent multiple elements, each with their own contributing value to reconstruct economic, social and cultural aspect of the Late Roman society in Northern Gaul. Each case study is first assessed from a bottom-up approach and considered by their relevant specific theoretical concepts and finally combined in a general interpretation towards an archaeological and historical narrative in the general conceptual framework as outlined in the previous chapter.

Part 2 A new Late Roman landscape for the southern Low Countries

4

Late Roman archaeology in Flanders

This chapter reviews the Late Roman archaeological record in Flanders and serves multiple goals. First a *status quaestionis* will provide an understanding of the development of Late Roman archaeology as part of the provincial Roman discipline from the early 20th century on. Next the inventory system used to gather data and explore potential trends will be introduced with the first spatial and chronological results. Further, the Late Roman archaeological record will be reviewed by dividing Flanders in seven micro-regional overviews that combine site, find and radiocarbon data, as well as provide a preliminary interpretative conclusion per micro-region. Last, an evaluation considering the recognisability and the persistence of certain uncritical paradigms is followed by a general interpretation on the Late Roman landscape within Flanders and its position in the Roman provincial structure of Northern Gaul.

4.1 Introduction

To understand the current state of research, a historiography is compiled on the development of Late Roman archaeology as part of the provincial Roman discipline in Flanders. Over the course of the 20th century, the Late Roman period was mainly subjected to the 'decline and fall' model that stained the last two centuries of the Roman West with a negative image. In general, the Romanisation discourse pulled the focus towards the early Roman period, although the 4th century was no stranger to the contemporary scholars. Much attention was given to the ethnic approach founded in the historical

narratives, even when this became heavily criticised for studies on the transition from Late Iron Age to early Roman period. At the end of the 20th century, the increase in scale and quantity of excavations resulted in an unseen growth of data that inspired synthesis studies on a micro-regional or chronological level. Although the Late Roman period was often mentioned in these, the general notion of barbarian destruction and abandonment from the 3rd century onward delayed the development of new models to understand the end of the Roman period. In the final years of the 20th century and the start of the 21st century, some researchers however were influenced by the transformation or Romanisation debate and started to look for different approaches and explanations. It is at this point that the current study is introduced in order to update the general knowledge and explore alternatives to the former models to apply to the transition from Roman to Medieval times.

4.1.1 Historiography

In this part of the chapter, we aim to deliver an overview of the evolution of the knowledge of Late Roman archaeology in Flanders to understand how the current knowledge was shaped by different interests and traditions. This review starts in the early 20th century with an outline of the general research on Roman culture in Northern Gaul. The Late Roman phase was strongly viewed from a 'decline and fall' perspective and was related to interpreting Roman, indigenous and Germanic interactions in a Romanisation paradigm. The later part of the 20th century saw an increase in sites and finds as the result from large-scale excavations. This created a new interest from an ethnic perspective and a teleological view on the development of the Frankish and Merovingian societies that followed. The rescue archaeology and rise of commercial archaeology, at the end of the 20th and beginning of the 21st century, reshaped the archaeological landscape by producing an abundance of new sites and finds. This growth in the archaeological record in a mostly commercial context, however, complicated the further development of synthesis studies, which are necessary to gain new insights in the transformations from the 3rd, 4th and 5th centuries in the rural hinterland of Northern Gaul. It is at this point that the current study starts its exploration of the new data and its reconsideration of the traditional knowledge for the Late Roman society of northern Gaul.

4.1.1.1 Early 20th century to the 1960's: Romanticising Romans and 'Decline and Fall'

The first half of the 20th century and the years following World War II were a time wherein the concept of Romanisation internationally dominated the mind-set of Roman archaeologist and historians. Belgian researchers however did not extensively partake in the debate in light of the ideological conflicts that coloured this era in Belgian history. The association of the Belgian archaeologist De Maeyer with the Nazi-regime, although not reflected in the contents of his work (De Clercq 2009, 50, note 1), resulted that topics such as Romanisation and Germanic incursions were generally avoided for the next decades (De Clercq 2009, 47-53). In general, for the early 20th century, the dominant view of the Roman culture was 'romantic', as it stood for civilisation, a unified state and a sophisticated high society. This very much in contrast to the 'indigenous primitive tribes' and 'barbaric Germanic warriors'. It stands to reason that, in the decades following WW II, the knowledge of the Late Roman period suffered from this rhetoric, since the 3rd to 5th century was considered a period in which Germanic tribes continuously raided the Western Roman Empire. The large migrations of the 5th century – i.e. the Migration period – were provided by the historical narrative formed from the antique sources and were seen as a large factor in the downfall of the Roman West.

Despite this general mind-set, certain finds and sites could not go unnoticed. The most prominent Late Roman site in Flanders was the former urban centre and capital of its *civitas*: Tongeren or *Atuatuca Tungrorum*. The visible remnants of the city walls, its urban character and numerous finds led to a high awareness of its Roman heritage. As early as 1935, Paquay already compiled a study on the 2nd and 4th century walls, and in 1947, Van der Weerd and De Laet wrote about the 4th century burials. The uncovering of the two large necropolises to the northeast and southwest of Tongeren made it the best documented Late Roman site in Flanders. Here, we can mention the studies by Van Crombruggen H. (1962) on the two necropolis sites of Tongeren and by Vanvinckenroye (1963; 1965) on Late Roman material from the 4th century burials.

The other parts of Flanders remained mainly deprived of Late Roman burials. In the large overview of Roman burials for Northern Gaul, Van Doorselaer (1964b) notes 4th century inhumations only in Molenbeek, Overhespen, Tongeren, Eeklo and Ronse. Importantly, for Tongeren, he mentioned that cremation was a continued practise in the 3rd and 4th century. Despite the recognition of prolonged cremation burials, this idea does not appear to have survived (see 4.4.1 Recogisability). Also worth mentioning is the note

of 'no weapons' alongside inhumation burials, which refers to the fixed image of what Germanic grave goods should have looked like. This notion remained mainly unchanged until the recent reconsideration of weapon burials (Theuws 2009).

The second well-known and intriguing site for the Late Roman period was the then long suspected Roman fort of Oudenburg, which by now has been confirmed. Already early on, the small town of Oudenburg was notorious for its military Roman origin based on a Medieval reference from the abbey of Oudenburg and the rectangular lay out of the town centre (Mertens 1958b; a). But it is not until the 21st century that elaborate excavations and studies took place and delivered detailed insights in this military stronghold (see mainly the work of Vanhoutte).

Besides these two focal points, the Late Roman archaeology in Flanders consisted mostly of notifications, finds and observations (such as the coin report from Roosens 1962). No real studies were undertaken for Flanders or Belgium, despite frequent Late Roman finds in the region.

A good illustration here are the numerous coin finds. Lallemand (1965a; b; 1968) elaborately studied the coin find from Koninksem with bronzes from Constantine to Arcadius, and the extensive 'treasure' of coins from Lier with more than 1000 Late Roman coins, ranging from Tetricus to Honorius. Additionally, Thirion (1967) listed over 40 sites in Flanders with Late Roman coins from Tetricus/Gallienus to Arcadius/Honorius.

For over a decade, from the end of the 1960's, Late Roman archaeology seems to have been abandoned by most scholars in Flanders. The many sporadic finds from the preceding period were not compiled in larger overviews or studies, such as had been done for the burials (Van Doorselaer 1964) or the numismatic evidence (Lallemand 1965, 1968 or Thirion 1967). The only noteworthy publication is on the 4th century burial from Oudenburg by Mertens and Van Impe (1971).

It is not until the historical and archaeological study of the Belgian coastal plain by Thoen in 1978 that the Late Roman period is noted in any significant manner. And even so, the 4th and 5th century played only a very small role in this narrative. Besides Oudenburg, the coastal plain did not reveal much settlements that could be placed beyond the end of the 3rd century. The explanation for this was sought in military and political factors alongside what was thought to be ecological changes in the coastal dynamics which resulted in great flooding and land-loss (i.e. the Dunkerque transgressions).

Unfortunately, the interpretation of a deserted coastal plain from AD 270 onwards, was extrapolated in the general Flemish archaeology and had a negative impact on the identification of all Late Roman archaeological features and material culture. This assumption was strengthened by the dominance of the 'decline and fall' mind-set for the end of the Western Roman Empire (see Chapter 2), along with the available evidence suggesting only the persistence of a militarised coastal plain, i.e. the *Litus Saxonicum*.

Meanwhile the study of Van Ossel (1979), on rural settlements south of the road Bavay-Cologne during the Late Roman phase in the *civitas Tongrorum*, illustrates that the 4th and 5th centuries were not unknown or forgotten in Northern Gaul. Only the interest to pursue these avenues was absent for the majority of Flanders in favour of earlier – and more visible – Roman history in Belgium.

4.1.1.2 Large scale excavations, regional and chronological studies: Germanic tribes and ethnic archaeology

New interest developed in the final two decades of the 20th century, due to large-scale excavations that uncovered many Roman sites, but more importantly, identified 4th century 'Germanic' settlements and material culture. After unilaterally viewing the Germanic presence as barbaric incursions for decades, new studies and scholars attempted to understand these Germanic settlers in the 4th and 5th century. The most prominent new sites included Donk (Van Impe 1980-1984), Neerharen-Rekem (De Boe 1981-1987), Kruishoutem (Vermeulen 1992; Vermeulen, Rogge, Van Durme 1993; Rogge and Braeckman 1996), Asper (Vermeulen 1983-1986; 1992) and Sint-Martens-Latem (Vermeulen 1983; 1985; 1988; 1992). Among these new sites, we can consider Kortrijk as well. The Roman presence here was known for quite some time, but only in 1988 did Rogge compile an overview of the Late Roman finds (Rogge 1988).

In addition to these newly discovered settlements, new finds from Tongeren also kept emerging. The most noteworthy Late Roman publication in this period came from Vanvinckenroye (1984) on the large southwest cemetery. The follow up study of the eastern cemetery would appear only in the nineties (Vanvinckenroye 1995). Additionally, Mertens sporadically revisited Oudenburg in this period, of which the most prominent publication consists of an overview of the Roman fort and the associated burials (Mertens 1987).

The rising number of excavations and finds resulted in the need for regional and chronological studies to contextualise these individual sites. Thoen was the first to update

his review of the coastal plain in Roman times (1987), followed by a chronological overview of the Waasland area (Thoen, et al. 1989). The Late Roman component, however, remained a small side-note in comparison to the attention given to the earlier Roman periods. Additionally, we can list a number of related studies that started to find a place for a (minor) Late Roman component: in the same year Rogge, Thoen and Vermeulen (1990) bundled their micro-regional studies to create a Roman narrative for the province of East-Flanders. The Late Roman period was also included in the review of excavations in the province of West-Flanders by Van Doorselaer (1992). A smaller study for the 'Westhoek', the most southern part of West-Flanders, contributed to the Late Roman image of the Flemish coastal plain (Roumegoux and Termote 1993). A similar micro-regional study based on numismatic evidence from the most southern part of East Flanders was published by Rogge and Beekmans (1994).

Just as ten years earlier with Van Ossel, the difference in research approach between the northern and southern part of Belgium is noteworthy. For instance, Brulet (1990) produced an extensive study on 4th and 5th century settlements in Northern Gaul. Of which the study of the Scheldt-Lys region by Vermeulen (1992) is the only comparison from Flanders in effort and detailed data, albeit on a much smaller scale (see further).

For these studies, it is necessary to mention that an uncritical use of written sources and ethnic interpretation of the encountered material culture resulted in an approach strongly associated with decline towards the Late Roman period. It was the general view that the highly advanced Roman society was torn apart by the troubles of the 3rd century, characterised by civil war which gave (primitive) barbaric tribes the opportunity to scour the land and bring destruction to the settlements they raided. All archaeological evidence dating after AD 275 was viewed from a Germanic perspective, with concepts such as 'Germanic colonisation' and 'Germanisation'. From reading antique authors, all unfamiliar material was attributed to Germanic tribes that were mainly identified, often teleologically, as (Salian) Franks or Saxons (e.g. Lodewijckx 1991; Van Es 1991). Nevertheless, much data was gathered in this phase of the archaeological research, which allows us to build upon these studies.

4.1.1.3 Introduction of transformation, continuity and *long durée* approaches

Despite the notion of decline, these regional studies had sparked a curiosity about the concept of migration and the potential roots of Medieval Europe in the 4th to 6th century.

Notions of continuity and *long durée* were more widely applied, although mainly focussing on the Germanic aspect of the 4th and 5th century.

The first large search for the provenance of the Germanic settlers was provided by the inter-regional petrographic study into Late-Roman 'Germanic' handmade pottery by De Paepe and Van Impe (1991). They focussed directly on the movement of people by comparing ceramics from Belgium, the Netherlands and northwest Germany. Their historical and archaeological contextualisation contributed much to the migration debate and the nature of the Late Roman settlements and is still widely used today.

In the same line of research, although more regionally inspired, we can mention the study on the handmade pottery from the Late Roman and the 'Migration' period (4th - 6th century) in the coastal area and the Scheldt valley (Rogge and Van Doorselaer 1990) (see Chapter 6).

The most detailed considerations on the changes in the Late Roman occupation, were delivered by Vermeulen (1992) for the Scheldt-Lys area with extrapolations to the larger region of the sandy soils in Flanders. He mainly focussed on the process of Romanisation and the 'moderate acculturation' of the rural landscape in comparison to the villa-area (on the loamy soils) and applied a political-military discourse supported by economic and natural conditions as motivators for change. Relevant to the study for Late Roman Flanders is his continuity approach between the earlier Roman phase and the Late Roman period. As a counterweight for Romanisation, he launched the term of 'Germanisation' (Vermeulen 1992, 256) to represent the divers process of acculturation between the Gallo-Roman society and the Germanic elements in the 4th and 5th century. The classical decline narrative of a political-economic crash, expedited by Germanic raids, ca. AD 275 was rejected, as well as the sole immigrant repopulation of the supposedly abandoned province. Instead, he argued that the Germanic incursions would have had little to no acculturating effect, given the relative short time span of a raid. The first influence would have occurred in the militarised coastal zone through contacts with the Germanic mercenaries. In his opinion, the real Germanisation took place at the end of the 4th century when the vacuum in the rural landscape provided Germanic people the opportunity to settle on arable land. The homogeneity of the people in these settlements could not be established, so both a sole Germanic group or a mix of indigenous and immigrants could have been possible. The society in the Scheldt basin is described as a rural egalitarian society based on agriculture and livestock (Vermeulen 1992, 247-249). The Germanic component is given as a reason for the evident lack in a break in the

settlement pattern ca. AD 406, i.e. the classic date given to the withdrawal of the Roman troops from Northern Gaul. Additionally, this 'Frankish' element is seen to have facilitated the integration of the sandy soils in the early Merovingian state. This new narrative from a mainly rural dataset provided a new intake on the Late Roman period in Flanders and showed that a strictly 'decline and fall' history is not supported by the archaeological evidence. Moreover, many reasons were given why this period is underrepresented in the archaeological record. Such as the lack of burials, which can be accounted for by the unknown burial rite and bad preservation in the sandy soils. Additionally, new economical and ecological factors are explored to explain the demographic drop at the end of the 3rd century. The depletion of arable soils or the change in scale of agricultural exploitation are two examples of alternative motives that have been pursued (Vermeulen 1992, 239-245). Despite his cautiousness on allocating ethnic labels, his interpretation was still influenced by the Romanisation paradigm and a post-colonial discourse, as is illustrated in the phrases such as: "the gradual colonisation by befriended Germanic people" (Vermeulen 1992, 247) or "the peaceful colonisation by Frankish settlers, who were grateful for the vacant arable land" (Vermeulen 1992, 257). Nevertheless, this study presented the first *longe durée* approach based on rural evidence connecting the Early and Late Roman period, as well as creating the idea of acculturation and continuity from the 3rd century towards the Merovingian period.

Simultaneously, Lodewijckx (1996) also searched for continuity in the Hesbaye region (southeast of Flanders), where he focussed on the area surrounding the Roman villa site at Wange - Damekot. The destruction of the 3rd century villa was believed to be caused by barbaric incursions, after which immigrated Franks settled on the site, who were, according to the material culture, '*quickly well-integrated in the Roman economy'* (Lodewijckx 1996, 214-217). These findings sparked the start of a Dutch-Flemish study into understanding the processes surrounding the Frankish migration in northern Gaul (Opsteyn and Lodewijckx 1998, 15) (see Chapter 6).

The trend of continuity coincided nicely with an interest in the origin and evolution of the 'linguistic frontier' in Belgium, i.e. the division between the Dutch and French speaking parts, and resulted in an overview for the entire Roman period for northern Gaul by Lamarcq and Rogge (1996). This book incorporated the archaeological material in a historical narrative, which remained very Germanic-orientated for the Late Roman period.

In general we can say that, although these studies were highly coloured by the concept of Germanisation and a focus on ethnicity, they presented a first *longe durée* narrative bridging the Roman and Early Medieval period creating the idea of cultural transformation and continuity from the 3rd century towards the Early Medieval period.

4.1.1.4 Rescue excavation and commercial archaeology: neglecting Late Roman archaeology

The research on the 4th and 5th century sketched above was mainly limited to the research areas of individual scholars. This changed from the 1990's onward, due to the large increase in excavations caused by the emergence of rescue archaeology and, in the 21st century, commercial archaeology. Although the studies presented above were widely known and referenced, the exponential increase in sites and material culture inadvertently caused a neglect of Late Roman archaeology, mainly due to problems with recognisability. The scholars who continued the work on Roman and Early Medieval archaeology, gradually moved away from the classical Romanisation paradigm. More importance was given to the indigenous culture and sociocultural transformations were linked to matters of identity, rather than ethnicity. Despite these new conceptual frameworks, we see that the old paradigms of Romanisation and ethnicity were not adjusted to the same degree for Late Roman archaeology. Arguably, this was caused by the more restricted knowledge and the absence of new interpretative studies for this period.

This point can be illustrated by the '*Frankenproject*' by Opsteyn, in which the ethnic approach was not abandoned or adjusted. However, a more nuanced view was adopted and it was recognised that the archaeological reality of the 4th and 5th century was more complex than a mere replacement of the indigenous Gallo-Roman population with Frankish immigrants. For instance, Germanic handmade pottery from Kontich and Elewijt dating to the 3rd century, confirmed that mobility and migration were not limited to the 4th and 5th century. Local elements, continuity, migration and assimilation were combined in a *long durée* study from the 3rd to the 6th century (Taayke, Opsteyn and Bouwmeester 1998; Opsteyn 2003). After the start of this project, the approach towards the excavations at Wange and its finds was adjusted accordingly and encompassed interpretations beyond a simple decline scenario. The Frankish migration, however, remained their main point of focus (Opsteyn and Lodewijckx 2001; 2004). Unfortunately, this project was never

completed and the results from the handmade pottery and the petrographic analyses were never published.

Furthermore, general research in Late Roman Flanders was mostly limited to the best-known locations, i.e. Tongeren and Oudenburg. The continued research on both locations was mainly led by archaeologists from the Agentschap Onroerend Erfgoed. Vanderhoeven and Vynckier oversaw most of the archaeology that happened in and around Tongeren and Oudenburg received new excavations led by Vanhoutte (see 4.3).

Sporadically, new sites were discovered and the Late Roman-Early Medieval period was often incorporated in the chronological overview. The site of Erps-Kwerps (Verbeeck 1994) in the vicinity of Wange is an addition worth mentioning. Sadly enough, in many of these studies, the prevailing views are uncritically copied, resulting in unsubstantiated interpretations. For example, the date of AD 260/270 and the assumed Germanic invasions are often used as a *deus ex machine* for explaining the end of a Roman occupation. A good illustration here is the work on Kerkhove, where it is stated that '*during the third quarter of the 3rd century the place [Kerkhove] fell as the result of Frankish and Saxon attacks'* (De Cock 1996, 85). No evidence of destruction is given, nor an end phase for the material culture. Other studies and reports could be discussed here, but that would take us too far.

In general, we can conclude that after an initial promising start with general (micro)regional and chronological studies in the early 1990's, the sudden growth of archaeological activity and thus finds, combined with limited time resources, restricted archaeologist rather than enabled them to perform constructive synopsis studies, resulting in an absence of theoretically and methodologically informed research on the Late Roman period in Flanders.

4.1.1.5 Revival of Late Roman archaeology?

Despite these 'continued' studies, the exponential growth in the number of excavations and finds from this new archaeological era for Flanders does not correspond with new finds of Late Roman archaeology. Occasionally, some separate smaller studies would add knowledge to the Late Roman landscape when considering archaeological finds from the Roman and Medieval origin. However, these are observations and cannot be seen as real studies, but rather as reports of the Late Roman archaeological record for which a general conclusive interpretation is (uncritically) copied from the studies mentioned above. Therefor, a detailed overview of sites and finds from these last 25 years will be given below, and forms the main review of the Late Roman period in Flanders for this study.

Finally, it has to be mentioned that, since the beginning of this project, the recognition of Late Roman material culture in the commercial archaeology in Flanders has been improving. This is mainly due to the better knowledge of Late Roman house plans, often associated with areas north of the Rhine, such as the Wijster-house types. As a result, more attention is given to this 4th and 5th century hiatus and the more poorly identifiable and datable material culture, such as handmade pottery.

4.1.2 Sources

The following section will present the compilation of the Late Roman archaeological record for Flanders. The data gathered here has been collected in an inventory system, called the 'Late Roman Inventory Flanders'. Multiple sources have been searched and the inventory system has been optimised to reduce the bias from the state of research in order to reveal patterns that will be closer to represent the historical reality.

The Late Roman Inventory Flanders is the collection of all sites and finds within the territory of present day Flanders that are considered to have a complete or partial date that falls, entirely or partially, within the parameters of the Late Roman period of this project, i.e. AD 270-450.

The data has been collected by an extensive literature study, a consultation of archives and the consultation of multiple databases. The literature study consisted of the published literature available and the reports produced by commercial archaeology. The latter were consulted in the library of the Agentschap Onroerend Erfgoed of which the last consultation dates to August 2013. Additionally, the archives of certain older excavations from the Agentschap Onroerend Erfgoed (former IAP and VIOE) and Ghent University were consulted. Unfortunately, much of the archives and the finds are missing from older excavations and could not be thoroughly reviewed in their totality.

The primary consulted database is the Centrale Archeologische Inventaris (CAI), which contains information on excavations, prospections and finds for Flanders in general. A query for all Late Roman sites and finds proved to produce a skewed report, due to repeated entries and inconsistent labelling. After careful revision of all Late Roman hits in the system, 292 entries remained. The last consultation of the CAI database occurred on January 9th 2015.

Secondly, the database of the Gallo-Roman Museum of Tongeren (GRMT-TMS) was consulted as well. This database contains information from in and around Tongeren and

additionally from the province of Limburg on both site and object level. In total, a query for all Late Roman sites and finds resulted in 3610 hits from the GRMT-TMS database. The large number of hits is the result of the registration of the individual objects, both *in situ* as well as *ex situ*. After careful consideration of each hit, a 100 locations with Late Roman sites and finds remained. Many entries have been found to overlap with the CAI, although the level of detail of individual finds revealed additional information. Only the sites and finds that were considered and described in publications were added to the inventory. The remaining finds were used as a comparative framework for the micro-region of Tongeren.

A third database that was consulted, was the Royal Institute for Cultural Heritage web based Radiocarbon database (Koninklijk Instituut voor Kunstpatrimonium: http://radiocarbon.kikirpa.be/). A query for all radiocarbon results between AD 270-450 was made and provided 168 results that matched, entirely or partially, the chronological parameters. The last consultation of the ^{14}C-KIK database occurred on January 14th 2014. These results have been handled separately from the inventory.

All this data has been gathered into a GIS-database to explore spatial and chronological patterns in the population of the Late Roman period. The Late Roman Inventory Flanders has to be considered as the state of archaeological research of 2014 (with only the addition of the more recent excavation at Nazareth - Eke due to direct involvement related to the handmade pottery that was found on the site). A full-text version with consice descriptions of every site and find as well as the main bibliographic references are included in Appendix 1.

4.2 Late Roman Inventory Flanders

At the start of this project, an extensive and detailed survey of the available literature, archaeological reports and the CAI database were consulted in search of every site, context or find that could be labelled “Late Roman”, i.e. datable between AD 270 and 450 within the boundaries of current day Flanders. This list represents the state of the archaeological research, rather than the historical reality and was compiled with the aim to be combined with the study from the Dutch counterpart of this project, in order to come closer to an understanding of the Late Roman landscape for the region of the Low

Countries. The entire research area was restricted to Flanders and the southern Netherlands, with selective comparisons in the adjacent areas of the northern Netherlands, West-Germany, Wallonia and northern France. The selection of comparative sites and finds varied depending on the nature of the specific subject (see Part 3). This list of Late Roman sites in the Flemish landscape represents an overview of the complete archaeological record available in 2013-2014, with some additions from new archaeological sites uncovered in 2015-2016.

The archaeological record has been restructured to optimise an objective approach in the evaluation of each site, context or find in its own right. The names of the sites, contexts and finds have been allocated a three-part label based on their location. The first part of the name is the primary municipality (*gemeente*), followed by the secondary municipality (*deelgemeente* or *stad*) and a distinct identifier provided by a topographical reference (*toponiem*), street name or year in which the find occurred. The third part is a devaluating allocation, i.e. when a topographical reference is not available, the relevant street name was chosen. If either one is not available, for instance in the case of a stray find from the 19th century, a date is assigned as the final part of the name. In this manner, the location of the specific site, context or find is evident from the entry name. The specific generic site name has been preserved in these names, since they often consist of the latter two elements. For instance, the well-known site of Donk becomes: 'Herk-de-Stad – Donk – Landwijkbroek'. Or in the case of an old stray find, such as the famous figurehead from the Scheldt becomes: 'Sint-Amands – Mariekerke – 1939'.

4.2.1 Spatial results

4.2.1.1 Late Roman Inventory System

As previously mentioned, the Late Roman Inventory Flanders has been designed not only to collect the information gathered from the different sources, but also to make a first exploration into potential spatial or chronological patterns by means of GIS. Therefore, the inventory has taken into account some extra factors per entry, containing information on its nature, quality and reliability. We will give a brief introduction and test for this system before continuing to explore the potential spatial and chronological patterns.

Each Late Roman site and find was awarded an entry name (as explained above) and description, and was appointed a dual value in order to distinguish the quality and reliability of each Late Roman entry.

Description

Each site, context or find is generally described by 'site type' (ST) and 'site category' (SC). A site type contains indications to the nature of the archaeological record, such as habitation, burial, structures, traces and finds. The site category contains a reference to the function of the archaeological features. For sites, this consists of allocations such as urban, rural, military. For separate contexts or traces, this consists of labels such as house, grave, well, pit, ditch, timber construction and so on. The finds are usually identified as stray finds or coin hoards. Additionally, a brief description listing the encountered archaeological elements has been added to each entry.

Table 1 Description of type value system

Type Value	Name	Description
1	Settlement	solid indications regarding settlement and/or spatial occupation between AD 270-450, based on the presence of complete identifiable structures and datable material culture and/or independent scientific dating such as ^{14}C or dendrochronology
2	Burial	burials that have been dated between AD 270-450, based on the associated material culture and/or stratigraphy
3	Activity	contexts, structures or traces without a clear association to a larger settlement or burial grounds, mainly dated by material culture and/or stratigraphy between AD 270-450
4	Stray find	artefact or find that can be dated by its nature between AD 270-450, without any (known) contexts
5	Unconfirmed	sites, contexts or finds that have been placed in the Late Roman period by literature or reports for which it was not possible to confirm or deny a date between AD 270-450. This includes uncertainties regarding their provenance, date or in site value

Appointed value system

In addition to a general description, a value system has been developed to ensure a critical evaluation of each archaeological feature which has been entered in this inventory, as well as procuring more nuanced results in the GIS analyses and maps.

The first appointed value is a type value (TV), which is related to the description and the differentiation based on type of archaeological source and its presumed historical nature or function. In case of overlap or conflict between values, the highest relevant category has been appointed, e.g. a rural site with clear coherent settlement evidence and one or multiple burials is appointed a type value of 1. In contrast, a burial ground or cemetery with unclear settlement evidence is appointed a type value of 2.

The second value is a quality value (QV), which is independent from the type value or the description of the entry. This value has been allocated to each archaeological feature based on a present-absent principle on four conditions that allow the entry to be evaluated for its quality and reliability regarding its Late Roman nature.

Table 2 Description of quality value system

Quality Conditions	Description
In situ	Can the site, context, structure or trace be positively evaluated as in situ?
Coherent Structures	Are the different structures and/or traces part of a coherent whole?
Datable Material	Does the site, context, trace contain datable material culture?
Analytical dates	Have independent dates been procured by analyses from supporting contextual features?

Based on a simple yes/no approach, these conditions can be added up to give an indication of the reliability of the archaeological record. In this case, yes equals 1 and no equals 0, by which the resulting quality value ranges between 0 and 4. Evidently, a 4 signifies a good reliability and a 0 indicates reasonable doubt to the allocation of a Late Roman label.

This simple value system allows us to assign different strengths to the different sites, contexts and finds to make sure that a complete settlement is not viewed equally to a stray coin in the distribution maps. It is acknowledged that this generalised system oversimplifies the historic reality of the archaeological record. Nevertheless, it provides an easy method to create a more informed view on the Late Roman landscape than what

would have been the result from a series of distribution maps in which each category of site, context and artefact was compared separately.

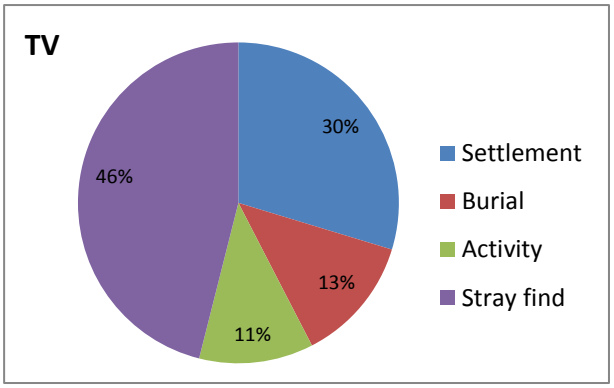


Figure 2 Frequency of each TV (type value) (n = 165).

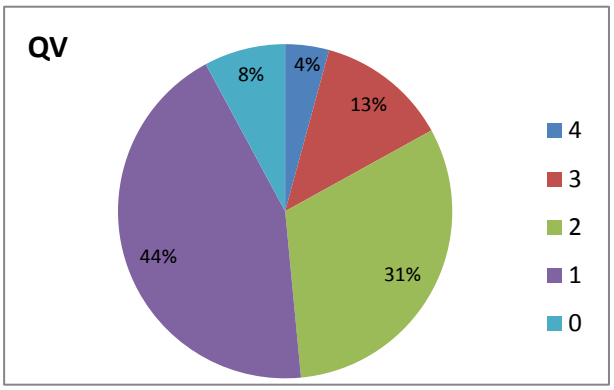


Figure 3 Frequency of each QV (quality alue) (n = 165).

In total, 165 entries from the test case area of Flanders were used in the following evaluation. Of these entries, approximately 45% contains direct evidence for Late Roman habitation, i.e. settlements and burials, respectively Type values 1 and 2 (Figure 2). The remaining half consists mostly of stray finds - Type value 4 - which take up almost half of the total spectre of the Late Roman archaeological record of Flanders. Most of these finds contain only one parameter for the Quality value, hence the 44% representation of QV 1 (Figure 3). Most finds and sites contain two or three reliability parameters, respectively 31% and 13% and only a very few, i.e. 4%, cover all parameters. This indicates that ca. one fifth of the dataset (17%) consists of sites and finds that can be reliably placed in the Late Roman period. Usually these consist of settlement structures, burials or find assemblages. An additional one third (31%) can be seen as quite reliable, given that half the quality parameters were met. The remaining half of the dataset has to be processed with caution, given that these are stray finds and by their nature less reliable to indicate occupation patterns. In the analyses of the data, these will be considered in relation to the more direct

settlement and burial evidence as a supportive layer of information indicative of a Late Roman presence in the area.

4.2.1.2 Occupation patterns

The main question before exploring the new data from Late Roman Flanders concerns population. The traditional narrative considered the rural hinterland abandoned and empty from the end of the 3rd century onwards. So we pose the question: exactly how abandoned or populated was this area of northern Gaul between AD 270 and 450? From the research history stated above, we can already mention that the current knowledge considers the coastal plain to have been deserted, with the exception of the Roman fort of Oudenburg of course. In contrast, a sparse continuity from the 3rd to the 4th century was proven for the Scheldt-Lys valley and assumed for the rest of the sandy soils in Flanders. Furthermore, the continuity from mid- to Late Roman has never been questioned for Tongeren, although it has been considered to have had a diminished population, given the smaller area encircled by the 4th century wall. Finally, a reoccupation of 'Frankish' immigrants is generally assumed from the later 4th century and the first half of the 5th century. Not much thought is given to the indigenous population for this phase.

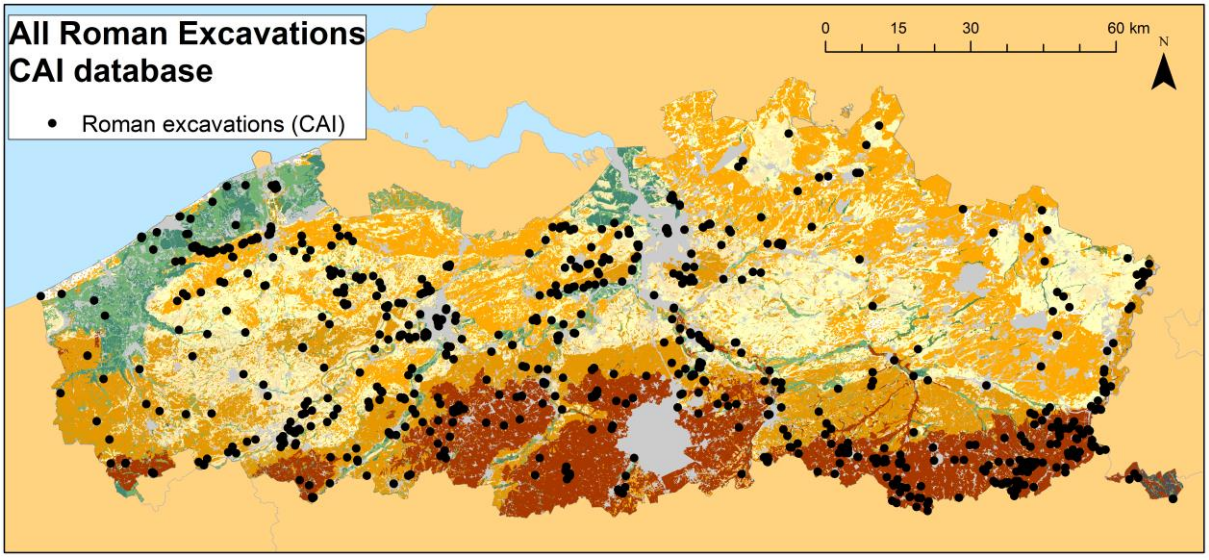


Figure 4 Locations of all Roman excavations present in the CAI database (version 2014, consulted on 09/01/2015).

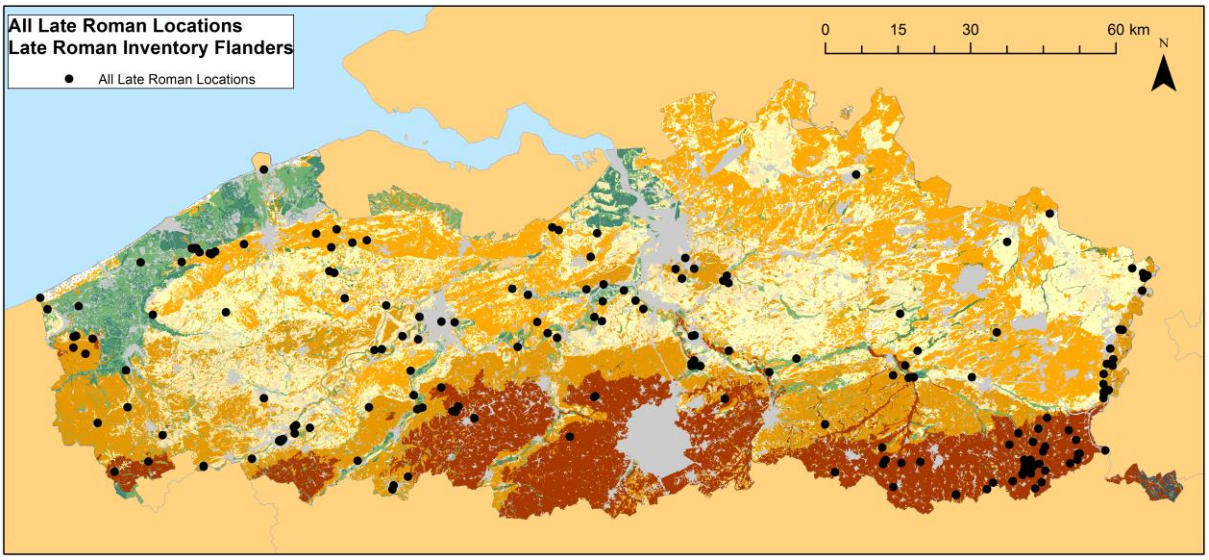


Figure 5 All locations with Late Roman sites or finds in present day Flanders (all entries from the LRIF).

To fully compare and estimate the occupation density – or lack thereof – in Late Roman Flanders, we would need the same level of detailed data from the Late Iron Age to the Merovingian period. Unfortunately, these are not available, so we have only the general Roman image to compare it to. An export file from the CAI database was made available containing all Roman excavations incorporated in the database by the end of 2014.[4] It has to be stated that this also is not an exhaustive image of the complete Roman population of the area, but merely a reflection of the state of research at this point in time (Figure 4). Additionally, all Roman sites and finds are included here, which all differ in scale, life span, quality and reliability.

When we consider the Late Roman sites and finds in the same manner, we can see that the number of sites has decreased immensely, although roughly the same areas remain occupied (Figure 5). This stresses additionally the state of research and issues of preservation and excavations. In a general observation, it is clear that entire areas are empty and other areas contain more sites and finds than originally considered, such as the entire Scheldt valley and the loamy soils that were thought to have been abandoned after the destruction of the villas. A dense concentration in and around Tongeren supports the continued population of the urban centre and its direct surroundings. Similarly this can be stated for Oudenburg, although on a smaller scale. Additionally, we

[4] For which we thank Katrien Cousserier. The CAI export was procured on 09/01/2015 and represents the state of research of 2014.

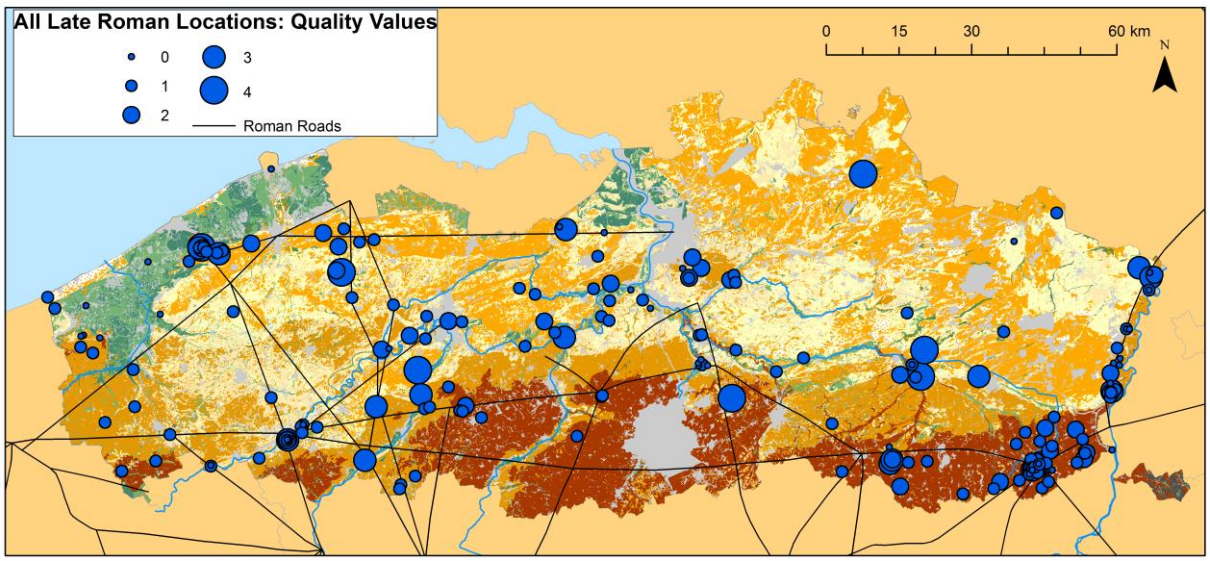


Figure 6 Reliability of the Late Roman archaeological record: all Late Roman locations represented by declining size according to Quality value.

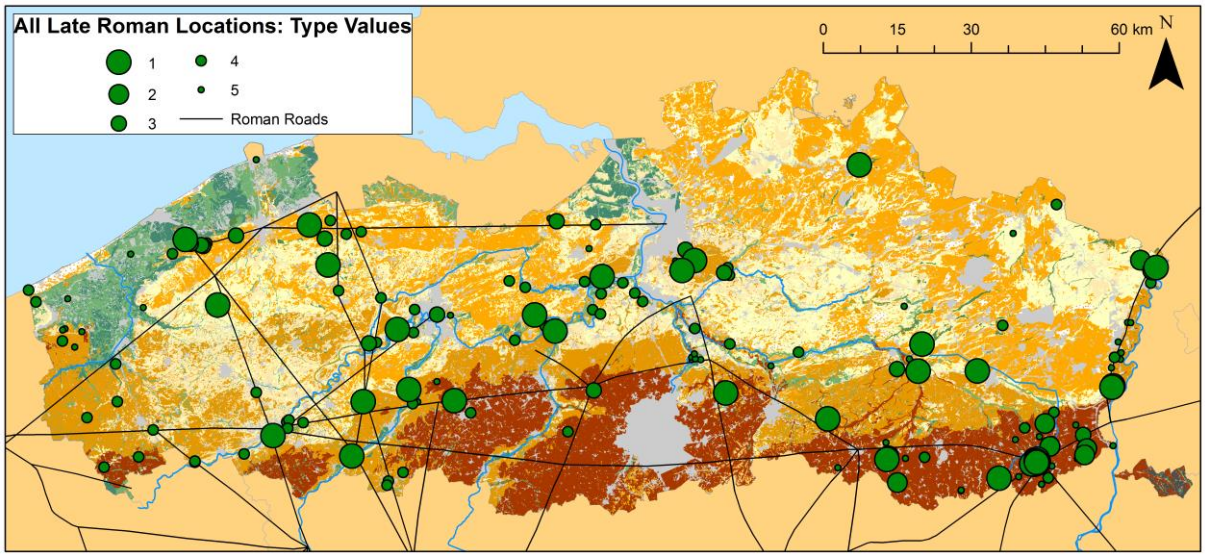


Figure 7 Nature of the Late Roman archaeological record: all Late Roman locations represented by declining size according to Type Value: settlement – burial – activity – stray finds – unconfirmed sites and finds.

see a great deal of Late Roman locations in the previous Menapian area, as well as some smaller clusters alongside the Demer and the Dyle.

However, this undifferentiated reflection of data does not allow us to make any substantial interpretation of the density and scale of the population and activity for the Late Roman period. For this, we use the Quality value (QV), in order to assess the reliability of these sites and finds, given that many are old finds and the former knowledge has been reconsidered with more recent interpretations (Figure 6). From this map, it becomes clear that the Late Roman landscape is not completely abandoned.

Interestingly, when the major roads are added to the map, it becomes apparent that most locations cluster in the vicinity rivers and roads. We can definitely discerns some patterns in the Late Roman population and activities.

To investigate these occupation patterns, the Type value (TV) provides a useful tool by attributing different scores to direct and indirect evidence for population. Basically, direct evidence consists of (partial) settlements and burials, whereas indirect evidence contains traces and finds without confirmed association to settlements. The latter will be referred to as evidence of activities, indicating the locations or areas that were part of the Late Roman landscape, only not directly occupied by permanent settlements to the best of our current knowledge. The type values show that the nearly all Late Roman settlements can be located directly along known major roads or in the vicinity of large rivers (Figure 7). Although the areas for Late Roman activities are not limited by this. Potentially, this indicates roads or networks of which we are not yet aware. Other preliminary explanations can be sought in the presence of more isolated agrarian or pastoral communities, or the persistence of occupation or certain crafts involving area-bound resources, for example such as salt, clay or peat winning. Although this remains hypothetical at this point.

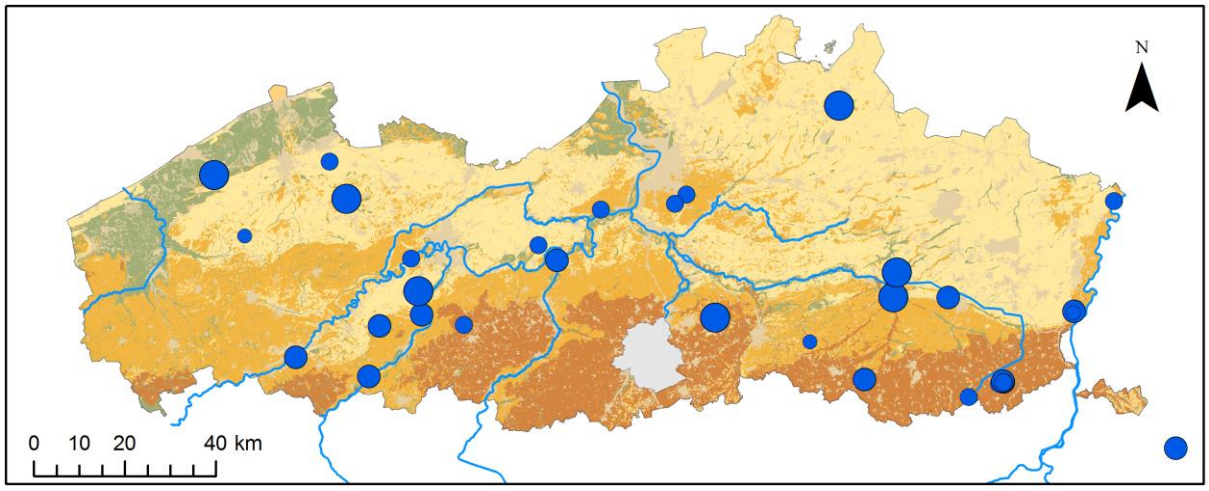


Figure 8 Confirmed Late Roman settlements and structures (TV 1) dated between AD 260/270 and 450. Reliability (QV) is expressed in size of the dot.

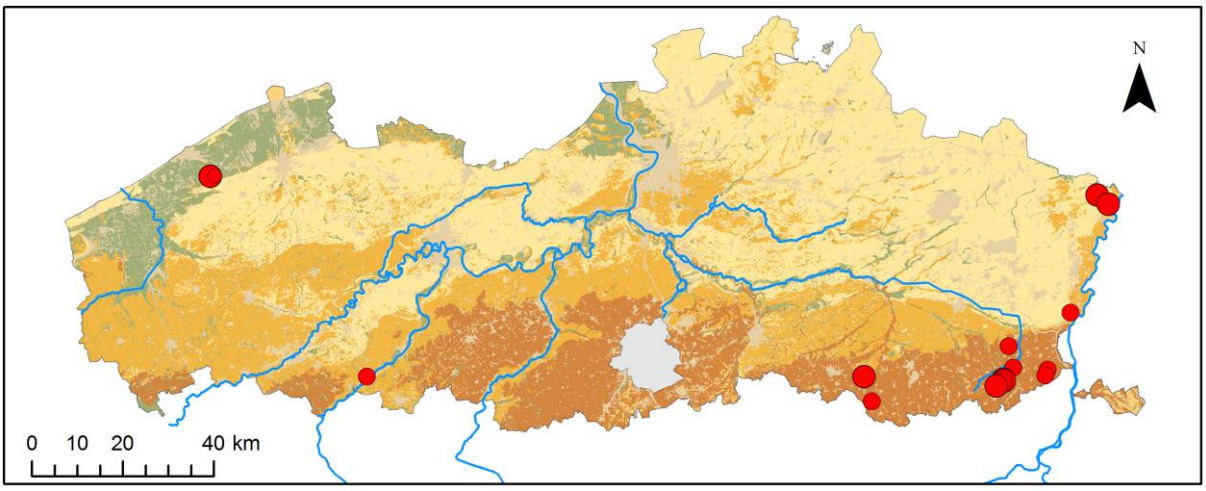


Figure 9 Confirmed Late Roman burials (TV 2) dated between AD 260/270 and 450. Reliability (QV) is expressed in size of the dot.

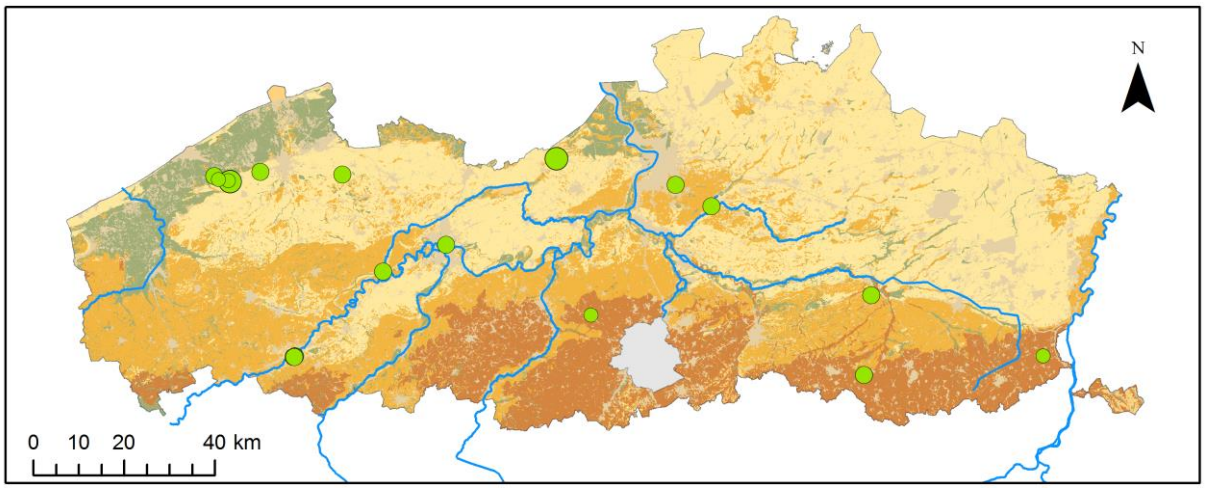


Figure 10 Confirmed Late Roman contexts, structures or traces without clear settlement nature (TV 3) dated between AD 260/270 and 450. Reliability (QV) is expressed in size of the dot.

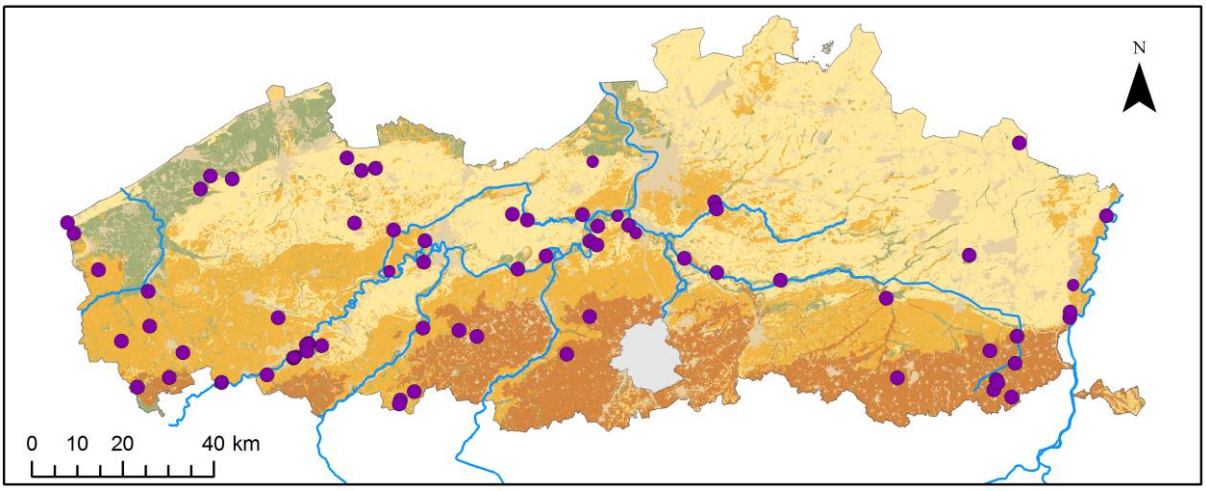


Figure 11 Confirmed Late Roman stray finds (TV 4) dated between AD 260/270 and 450. Reliability (QV) is expressed in size of the dot.

When the different types of Late Roman archaeological sites and finds are plotted separately (Figure 8, 9, 10 and 11), we see that the distribution pattern for the stray finds reflects the combination of settlements, burials and traces of activity together and confirms the clustering along rivers. Remarkable is the distinct distribution of burials, which will be explored further (see 0). All these sites and finds have been combined with their quality value to create a differentiated image, reflecting the reliability of dating the corresponding site or find between AD 260/270 and 450.

In general, a first answer to our question on the Late Roman occupation is that the population density appears to be less dense as in the 2nd and 3rd centuries. Although, it can be stated that this period in time proved to be an exceptional case for a largely rural landscape. The settlement restrictions to the rivers, roads and the large central places can traditionally be explained as a safety mechanism, in which 'passive' farmers and civilians seek protection of the nearest military presence. Not much evidence appears to be present to support such an idea. Perhaps an economical approach can provide a more satisfactory explanation, in which the disappearance of the villa-system caused an economical change and led people to prefer locations with access to active networks. We will revisit this issue further on (see 4.4.3).

By applying the value system, a more differentiated image than a mere dot-distribution can be reconstructed. Both the function and scale of a site as well as its reliability can be taken into account. Initially, this will appear to downplay or overestimate certain sites or finds, nonetheless, the overall picture that emerges for each area will be more differentiated and closer to the historical reality than a mere review of all Late Roman features (compare Figure 5 and Figure 12). It also allows us to minimise the contradictory sociocultural biases in the labelling of a site, such as Roman vs Germanic or military vs civilian. After all, for the Late Roman society, these were not mutually exclusive and would only obscure the general demographic narrative based on the archaeological record. Nevertheless, at the end of this spatial and chronological assessment, we will revisit these issues and discuss them in the proper sociocultural transformations and their impact on the settlements and population of this period.

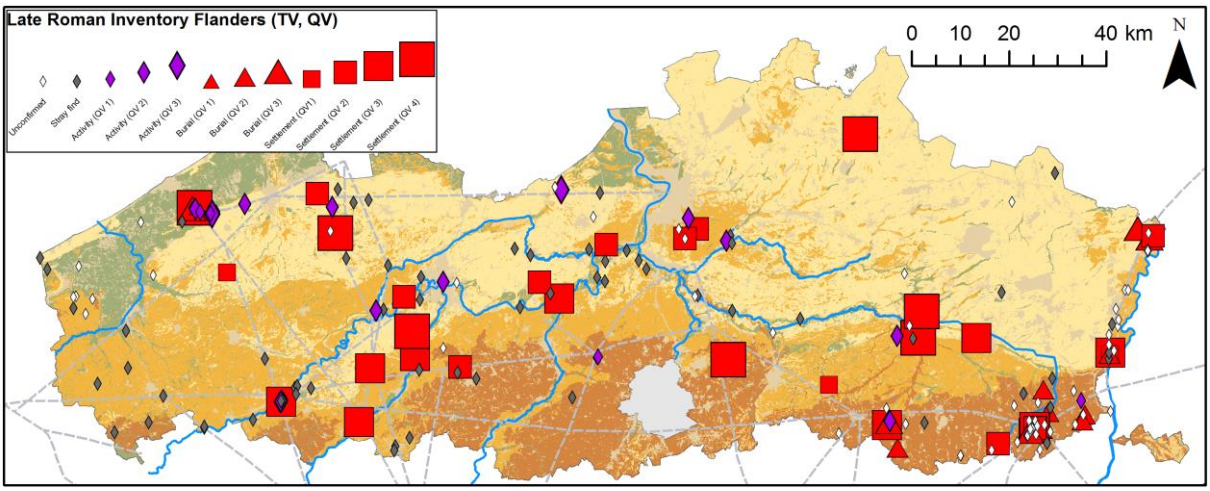


Figure 12 Late Roman Inventory Flanders with Type and Quality values (TV, QV).
1, 4-3-2-1: settlement with quality value ranging from 4 to 1 – red square;
2, 3-2-1: burial with quality value ranging from 3 to 1 – blue triangle;
3, 3-2-1 activity traces with quality value ranging from 3 to 1 – green circle;
4, 1-0: stray finds with quality value 1 to 0 – purple star;
5, 2-1-0: unconfirmed sites and finds with quality value ranging from 2 to 0 – grey diamonds.

4.2.2 Chronological results

Before continuing to the interpretation of these occupation patterns, it is necessary to re-evaluate the chronological evidence and the different phases of Late Roman Northern Gaul. As we have seen in the introduction, mainly a general Late Roman to Early Medieval chronology (4th to 6th century) is given to many sites and finds. Similarly, much of the portable material culture is often dated to the 4th and 5th century in general. Furthermore, the end of the 3rd century is often not considered due to the AD 260/270 barrier. The traditional chronology is clear and over-simplified: a major abandonment after AD260/270 and a repopulation by Germanic settlers at the end of the 4th century, which continues to the middle or the end of the 5th century. The sites that appear to continue into or start in the interval between these two historical events (without Germanic material) are considered rare and are dated to the 4th century in general. This image is the result of trying to align the archaeological record with historically attested events and, at this point, only obscures the archaeological details further.

4.2.2.1 Sample selection and methodology

Every date acquired by radiocarbon analyses or dendrochronology present in the abovementioned literature, reports and databases has been noted and taken into account

in the consideration of the Late Roman sites and finds. The bulk of the dates used in this chronological reconsideration, however, were collected from the Royal Institute for Cultural Heritage web based Radiocarbon database (http://C14.kikirpa.be/). A query for all radiocarbon dates between 1800 and 1500 BP was performed and provided 168 valid results from archaeological and geological samples. The last consultation of the ^{14}C-KIK database occurred on January 14th 2014.

The original results (BP) were recalibrated by use of the OxCal 4.2.3 online software (https://C14.arch.ox.aca.uk/) to obtain calibrated dates (calBC/calAD) and probability plots (Appendix 1). The dates present in the literature and reports that were not present in the ^{14}C-KIK database were added. By focussing on the archaeological samples from Flanders and removing dates that proved to be inaccurate and imprecise, 119 radiocarbon dates remained available for further processing. The remaining dates were sorted by mean and median to create a chronological sequence from the Mid-Roman period to the Early Medieval period, approximately from the early 3rd century to the late 6th century calAD.

The selection of radiocarbon samples cannot be interpreted to unilaterally represent the occupation of the entire Flemish landscape from the 3rd to the 6th century. As always, this is a mere selection, of which we had no control over the sampling circumstances. The dates available from the ^{14}C-KIK database are the product of independent archaeologists submitting samples for radiocarbon dating. This usually depends on available resources and intent of the individual archaeologist, but also the encounter of suitable material to sample. When multiple suitable carbon sources were available, choices were made, given that not every piece of charcoal, wood or bone can be submitted for radiocarbon dating. All these circumstances and more have limited the current data available to us. Nonetheless, we can use these radiocarbon dates as confirmation of occupation in the indicated time range and can thus be used to confirm or discard certain notions regarding the Late Roman period, independently from the dates obtained by material culture and stratigraphy.

For this reason, we will use the ^{14}C-data very specifically to answer questions related to the assumed archaeological and historical reality of the Late Roman occupation of Flanders, between ca. AD 260 and 450.

4.2.2.2 Chronological (re)considerations

The first question to answer is the issue of the large-scale abandonment around AD 260-270 as a consequence of the 3rd century crisis. It has been demonstrated already that this image is highly contested, both from a historical standpoint as from the new archaeological data. By plotting the radiocarbon data in a chronological sequence another indication for the presence or absence of population and activity can be received. Figure 13 displays all 119 radiocarbon dates for Flanders within the parameters of 1800 to 1500 BP. This roughly corresponds from the 2nd and 3rd century to the 6th century calAD. On the box-and-whiskers sequence plot, the smallest confidence of 68.2% is represented as the box (in green) and the highest confidence of 99.7% is represented as the whiskers (in white). In this manner, each date is represented in both its smallest and largest range possible. From this sequence, it is clear that there is no interruption in the chronology, nor do a large number of dates end in the second half of the 3rd century. Rather on the contrary, many dates are present for the second half of the 3rd century and the start of the 4th century. In all, it appears that there are more dates available for the 3rd to 4th century transition than for the bulk of the 4th century. This corresponds with the drop in number of settlements for the Late Roman period in general. Possibly, it is more correct to place the largest period of abandonment in the middle of the 4th century.

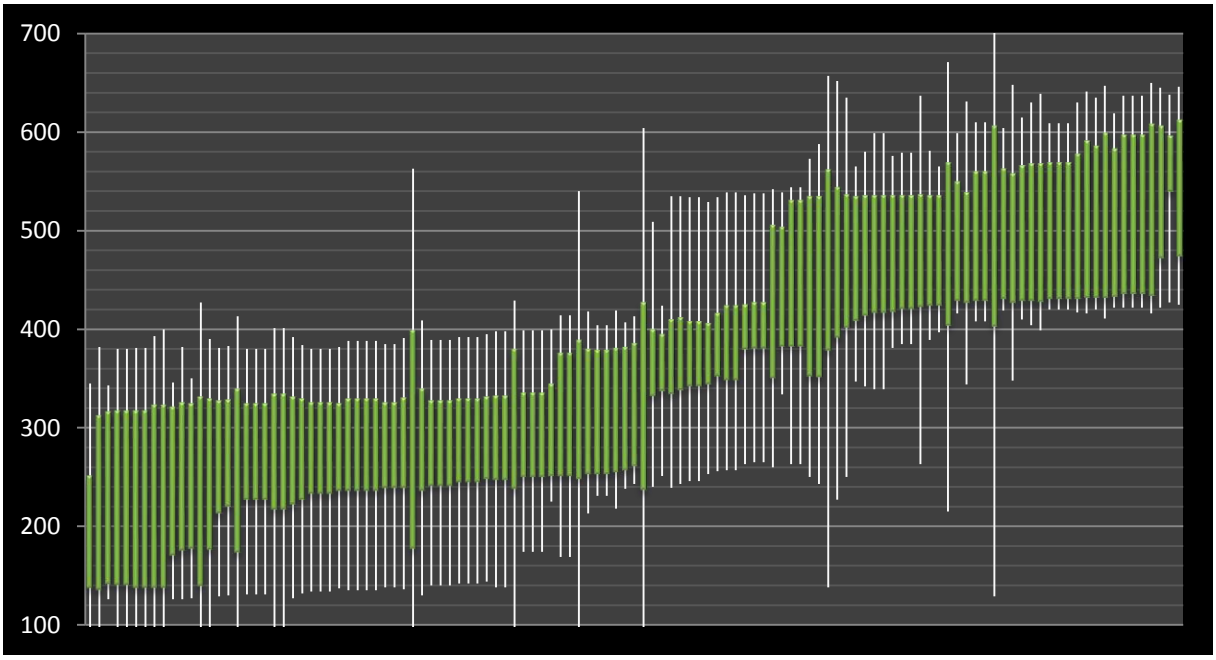


Figure 13 Box-and-whiskers sequence of ^{14}C-dates: the box (green) represents the smallest confidence (68.2%) and the whiskers (white) present the largest confidence (99.7%) (n = 119).

The question that follows from this chronological sequence, is whether this represents a regional continuous occupation for the entire territory of Flanders or are there different phases of abandonment and reoccupation that vary on a micro-regional scale? Unfortunately, with the current sample distribution it is impossible to give a conclusive answer to that question. Nevertheless, it is possible to use the available data to confirm the continuity of certain areas throughout the entire Late Roman period, as well as visualise the confirmed activity at a specific phase in this period.

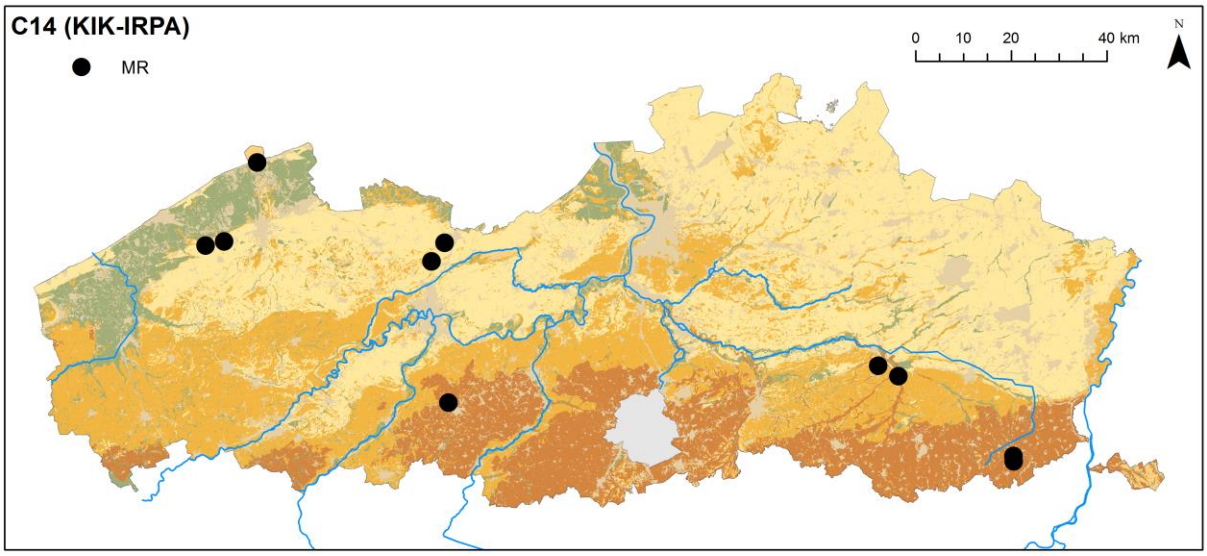


Figure 14 Locations with Mid-Roman ^{14}C samples with a median between 220 and 260 calAD.

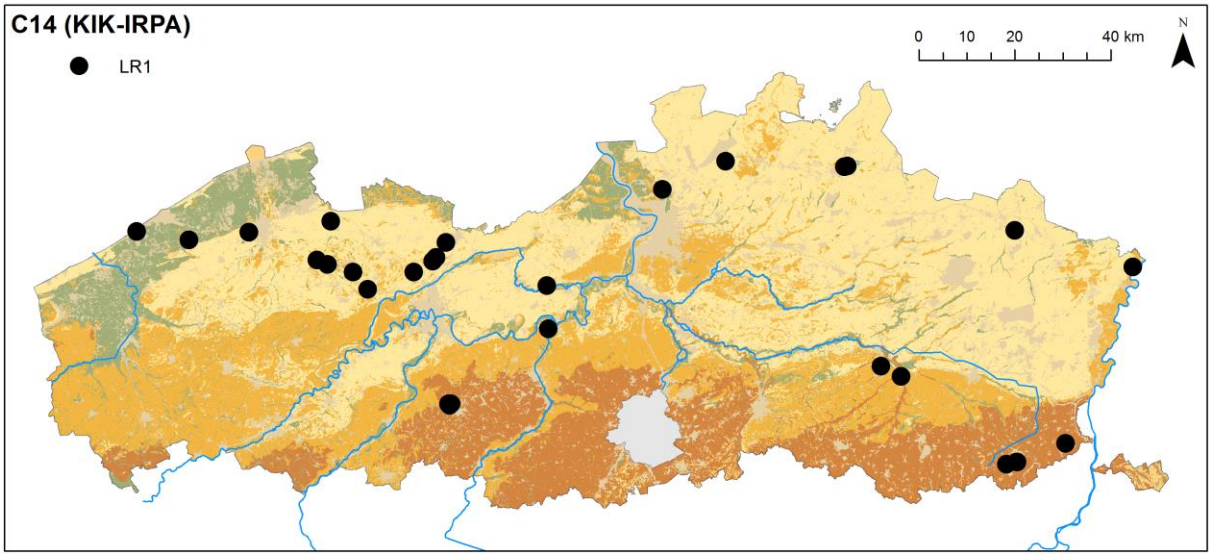


Figure 15 Locations with Late Roman ^{14}C samples with a median between 260 and 325 calAD.

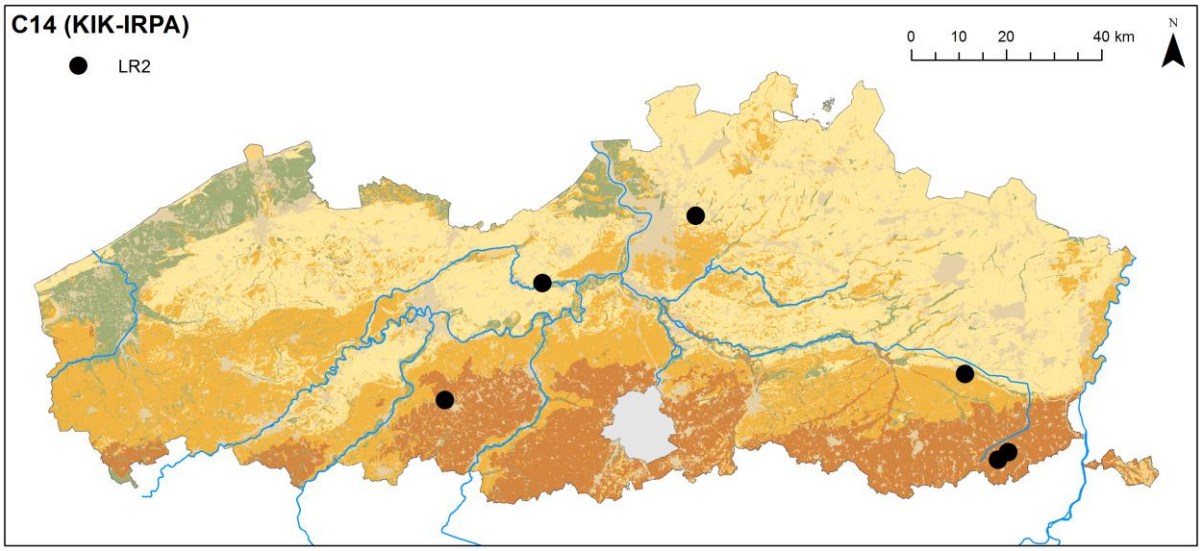


Figure 16 Locations with Late Roman ^{14}C samples with a median between 325 and 375 calAD.

The first image (Figure 14) represents the samples that were considered to be potentially at the earliest stages of the Late Roman period, but more likely can be solidly placed in the earlier 3rd century. It has to be taken into account that only the samples with a date starting from 1800BP were included. This map in no way represents all radiocarbon samples or active sites from the 3rd century. It merely gives us a starting point to compare the next phase i.e. the end of the 3rd century and the transition to the 4th century. Here (Figure 15), some sites can be considered very likely to represent a continuity crossing the AD 260/270 barrier. We see a direct overlap of the dates from Evergem-Kluizendok and Tongeren, as well as the area of Donk and Halen. Additionally, the broader area of Oudenburg-Brugge appears to remain active in the second half of the 3rd century.

Further on, towards the first half and middle of the 4th century, we see a drop in samples (Figure 16). This can relate to the reduced number of settlements or to the recognisability for solid 4th century sites. The combination of both seems most likely and additionally the uncontrolled randomness of sample selection for a larger archaeological area also plays a role. Nevertheless, a drop is present, only the scale and significance can be debated. Oddly enough, the drop is more likely to have occurred not at the end of the 3rd century, but rather halfway through the 4th century. Sites that show a high probability of continued activity are Velzeke, Waasmunster and Tongeren. Again, this does not imply that the rest of the landscape was deserted, only that for these sites a continuity into the 4th century can be argued more strongly. Other dates that could indicate active sites or occupation in this 'reduced population' are dates originating from Wijnegem and Hasselt.

These three maps (Figures 14, 15 and 16) together represent the largest probability of active sites for the end of the 3rd century and the beginning of the 4th century. Based solely on the presence of 51 radiocarbon dates (66 if you take into account the earliest samples) with a good chance of belonging to the second half of the 3rd century and start of the 4th, it seems unlikely that the supposed chronological gap is present. This does not mean that there were no abandoned or destroyed settlements, nor that every 3rd century settlement continued on into the Late Roman period. It does, however, provide a warning that the fixed historical interpretation cannot be used as an explanation for the end of a settlement, nor that an end date in the third quarter of the 3rd century can be assumed without evidence. No longer do the 'consequences of the 3rd century crisis' or the 'Germanic raids' from the 3rd century provide a satisfactory end phase for rural settlements in the hinterland of Northern Gaul. If no explicit and certain evidence for destruction or abandonment is present that is supported by material culture or stratigraphy, the 3rd century sites should be allowed to continue to the end of that century. As is the case for the 1st and 2nd century.

When we aim our focus on the 4th century, an image presents itself other than the accepted archaeological considerations. In general, the presence of 4th century Argonne samian ware, Eifel ware and coins from the Constantinian dynasty is considered to represent that this part of the province was once again part of the interregional network of the Roman Empire. The radiocarbon dates, however, point to the possibility of a different reality. If Figures 15, 16 and 17 are combined, enveloping the complete 4th century, only dates from Velzeke and Tongeren demonstrate a potential continuity for the entire century. In general, there are less radiocarbon dates available for the middle and end of the 4th century than for the 3rd to 4th century continuity. Merely ca. 30 radiocarbon dates can reliably be placed in the 4th century (with overlap of 4th century medians from the previous phase). Furthermore, a spatial pattern emerges from the sample distribution. Although this probably represents only the state of archaeological research, it cannot go unnoticed that the continuity from the start to the middle of the 4th century cannot be confirmed for the west of Flanders, but the presence of late 4th century occupation is supported on multiple sites.

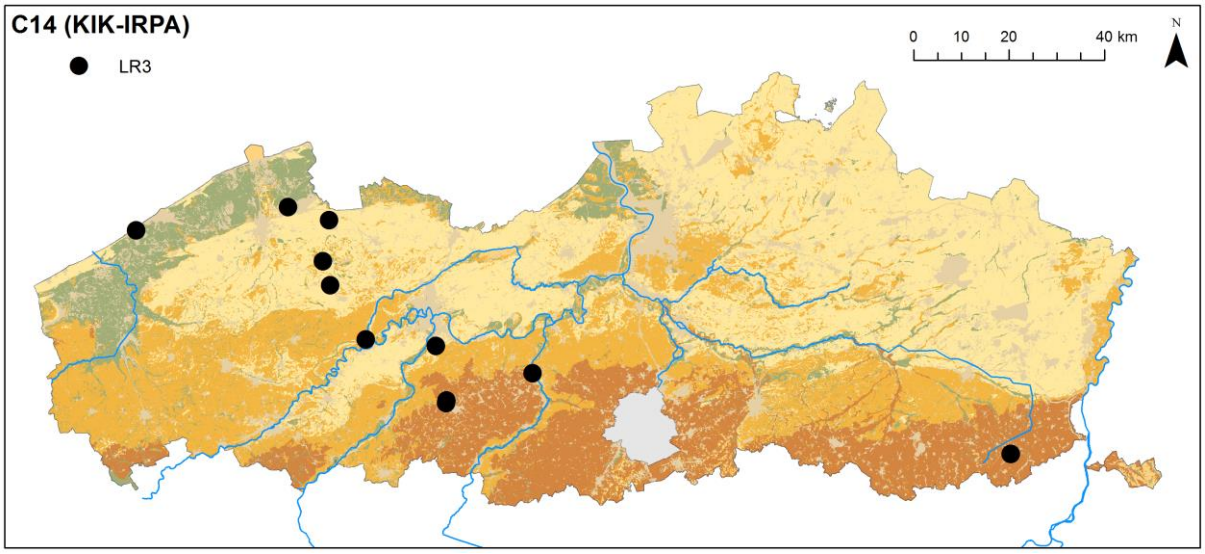


Figure 17 Locations with Late Roman ^{14}C samples with a median between 375 and 425 calAD.

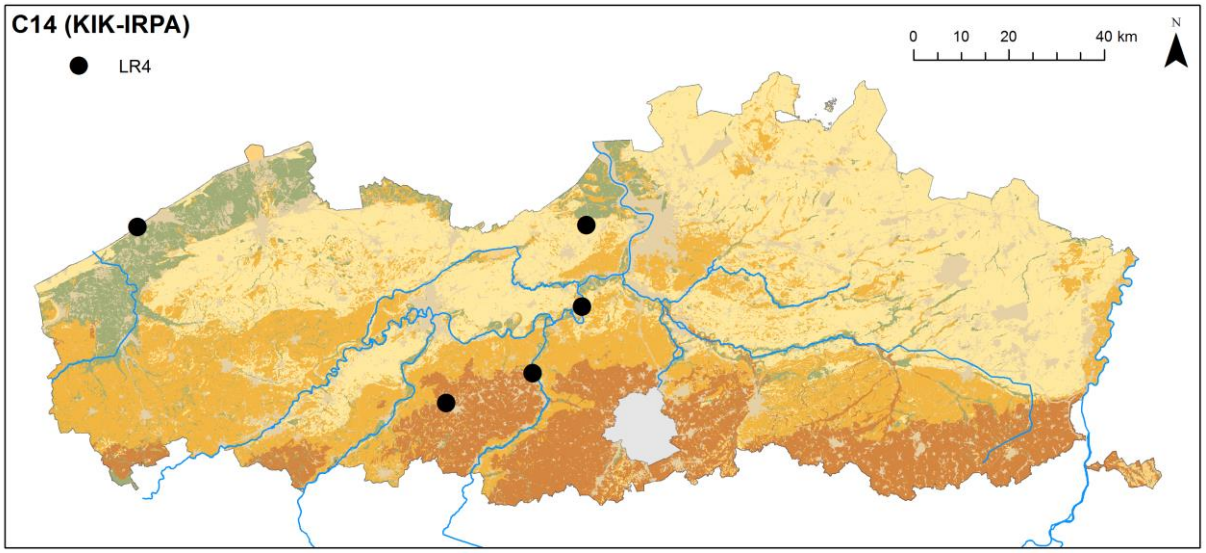


Figure 18 Locations with Late Roman ^{14}C samples with a median between 425 and 475 calAD.

Moreover, confirmation by radiocarbon lacks for late 4th century activity in the eastern half of Flanders, with the exception of Tongeren. Although there are no direct ^{14}C overlaps for the entire 4th century, the central part of Flanders - i.e. the Scheldt basin with its tributaries - shows the largest potential for overall continuity. It is evident though that not the entire occupation dynamics can be reconstructed from this evidence. It this does however address the need to consider processes of abandonment and repopulation on a small scale. Additionally, it forces us to recognise that the different areas in the region of Flanders require localised explanatory models for the demographic dynamics of the Late Roman period and, most likely, for the Roman period in total.

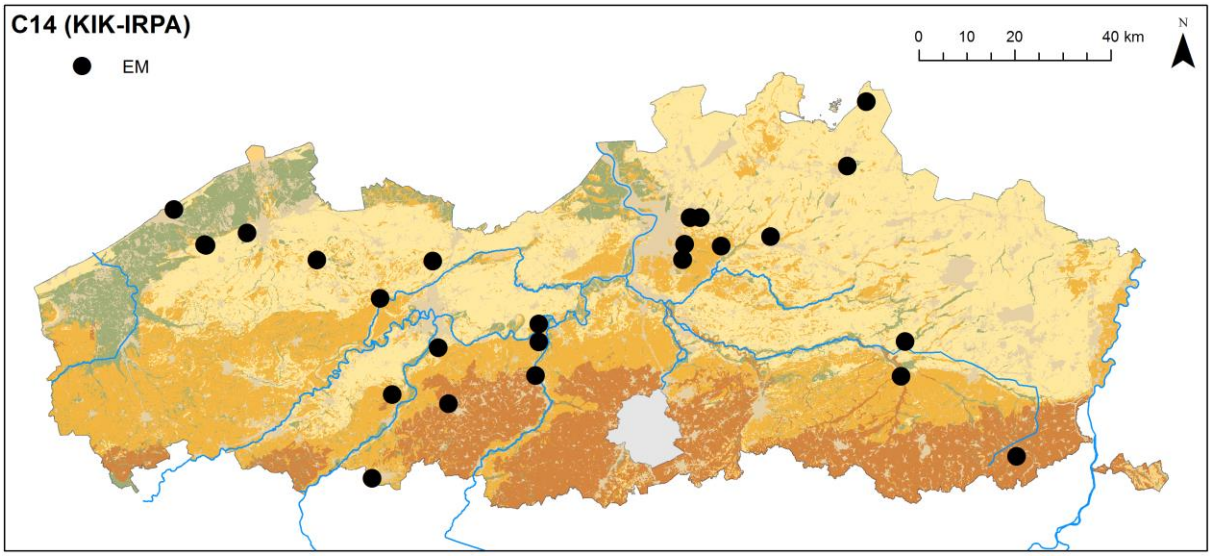


Figure 19 Locations with Early Medieval (Merovingian) ^{14}C samples with a median between 475 and 560 calAD.

The 4th to 5th century crossover also deserves separate attention. In general, this period is seen as a phase of repopulation by Germanic settlers, historically linked with the 'Salian Franks' and the result of the actions of Julian in Gaul ca. AD 360 (cfr. Ammianus). Again, we can confirm only a part of the settlements that were present in that phase by radiocarbon dates (Figure 17). Admittedly, the number of samples is again higher, indicating a potential rise in sites. Though, the need to confirm chronology of sites with Germanic features is a more likely explanation. Nevertheless, a number of sites, mostly in the west and central areas of Flanders can be confirmed to have a good chance of an active population. We need to consider this information in correspondence with the following period (Figure 18), which demonstrates a drop in numbers of samples. This in itself is not significant, especially not when trying to prove the short-term occupation of settlements. What is significant, is that the continuity from the 4th into the 5th century is supported for the western and central areas in Flanders. The region between the coastal plain and the sandy soils of the Scheldt basin remained active and populated, to varying degree and scale of course. Nonetheless, this contests the long standing view of an empty coastal hinterland with the Roman fort of Oudenburg as a solitary island of Roman and military culture. This issue will be considered in greater detail further on (see 4.4).

Finally, the last chronological phase present in the 1800-1500 BP parameters is the transition to the Early Medieval period and the Merovingian society. The last map (Figure 19) shows a larger number of samples, representing the need to date these sites to make a positive identification of their chronology as well as a rise in the number of sites. Not much direct continuity is offered by radiocarbon dates, which does not in itself

indicate habitation intervals. What is most important is that the same areas remain active. And not only in comparison to the earlier 5th century, but also compared to 3rd and 4th century dates. The recurrent selection of the same locations for repopulation and new settlements indicate a larger underlying reason for this phenomenon. Possible explanations can consist of ecological and environmental causes, such as soil properties or the presence of pasture or woodlands. Other reasons can be sought in accessibility to economic networks, the presence of political or military power, the continuity of local elites to control landownership and surplus, or even ties to the traditional ancestral landscape in relation to identity or land claiming. It is clear that many questions remain once the Late Roman population is confirmed.

To conclude these chronological reconsiderations based on a nearly random set of radiocarbon samples, it can be stated that we are presented with many new problems. By recalibrating all dates between 1800 and 1500 BP, many sites received a Late Roman chronology that are not present in the Late Roman Inventory of Flanders, nor are regarded to have been potentially Late Roman in their original excavation, such as locations in Brugge or the vicus of Velzeke. Furthermore, others that have been placed in the 4th or start of the 5th century, received a later date putting these in the later 5th century of which it can be debated if these can still be considered as Late Roman sites, such as Meldert. Either, this means that the radiocarbon dates cannot be trusted to differentiate more precisely than a mere general periodic scale: Mid-Roman, Late Roman, Early Medieval. Or, this indicates that the presence or absence call for the Late Roman period has generally been based on the wrong indicators. Overall, the presence of 4th century Argonne samian or Eifel ware is deemed necessary to confirm a Late Roman date. Increasingly, the presence of Germanic finds and structures has been considered to be a good Late Roman identifier. A few things are wrong with these suppositions.

The first is the focus on imported ware to assign a Late Roman date tends to single out only the sites with economic connections or where these goods were valued. This approach is very useful for the majority of the 1st to the 3rd century, when large amounts of imports are present and the use of specific goods is fairly well-known. However, for the Late Roman society, we have no good indications which people used what objects and how restricted their use and availability was. Furthermore, the importance of handmade pottery increased again from the middle of the 3rd century onward. Of course, it is difficult to confirm a date when the material culture can give no conclusive identification. In that case, it should be considered that a Late Roman phase cannot be excluded either.

Moreover, it is necessary to take into account that for a rural society, most commodities are not archaeologically visible: such as the harvest, animals, objects in perishable materials, etc. In short, as we have learned from the longstanding debate on Romanisation, we are dealing with only a fraction of the Late Roman material culture and cannot focus to narrowly on the exotic and non-local products.

The second major problem is the focus on the Germanic aspect of Late Roman society. It cannot be denied that Germanic groups and individuals were present and that they shaped the Late Roman society in a very active manner. Nonetheless, the local Gallo-Roman society that received so much attention for the earlier Roman period and was, rightfully, appointed a larger agency in the shaping of the Gallo-Roman society in Northern Gaul, seems to have become neglected for this later phase.

In conclusion, new parameters are needed to identify Late Roman features. It is clear that the social and economical situation has changed in comparison the 1st to 3rd centuries, so a focus on imports and non-local elements does not suffice and allows the historical reality to allude us. A new approach has to be developed in which the rural and urban elements of the Late Roman non-villa society are considered in their proper context.

4.3 Late Roman occupation density and activity

In the following section, we will review all the Late Roman sites, finds and radiocarbon dates for which the area of Flanders has been divided into seven micro-regions. A concise outline for each region will be given by first summarising all the data available from literature, reports and databases, followed by a general intepretation for the entire area and concluded with a map from the area drawn according to the inventory sytem (as explained above). If more information on specific sites, finds or dates are required, please consult Appendix 1.

To re-evaluate the Late Roman landscape in Flanders, a detailed review of the different areas demonstrating clusters of sites, finds and dates is necessary. This review will start in the west at the coastal plain in the area around Oudenburg and will move east towards Tongeren. The focus will lie on the population and activity clusters, although some

attention will also be given to areas less well researched or lacking concrete evidence of habitation.

4.3.1 Coastal area

We will start by examining a part of the coastal plain with the focus on the area around the Roman fort of Oudenburg and extension towards Brugge. The *castellum* of Oudenburg[5] (Figure 20) lies on a part of the Gistel-Brugge-Maldegem-Stekene sandy ridge in the coastal landscape that consists further mainly of clay soils and tidal channels, of which the latter provided direct access to the North Sea (Vanhoutte 2007, 199). Already an economically thriving settlement was present on this location from the 1st century onwards. Additionally, at least two main roads connected Oudenburg to the coastal hinterland and the rest of Gaul. The first road is called 'the Sea road' (Zeeweg) and runs southeast to Kortrijk and on to Bavay. The second road connects Oudenburg with Brugge and Aardenburg and is referred to as 'the Sand street' (Zandstraat) (De Meulemeester and Dewilde 1987, 225-231; Hollevoet 1992, 202; 1993, 211-212). On this strategic point in the landscape, the fort was created ca. AD 200 and was reconstructed a number of times. The current knowledge indicates that there are gaps between certain occupation phases, especially for the timber and earthen fortification phases in the 3rd century. During this time, the civilian settlement and military presence coexisted alongside each other. Around the third quarter of the 3rd century, however, the civilian settlement appeared to have been abandoned and only a military presence resided at Oudenburg (Vanhoutte, et al. 2009, 199-200). From this time on, the military occupation possibly became more permanent, expressed in the construction of a stone fort that was incorporated in the large coastal defensive system on both sides of the channel known as the *Litus Saxonicum* (for an overview on the chronology, internal structures, activities and daily life of the inhabitants of the fort, see Vanhoutte and Patrouille 2003; Vanhoutte 2007; 2009; Vanhoutte, et al. 2009).

The existence of an active population in this part of Flanders throughout the entire span of the Late Roman period is without question, with or without the gaps in the

[5] The military fort of Oudenburg will only be considered in its totality and not in detail. The many finds from this site will be addressed in the upcoming PhD dissertation of Sofie Vanhoutte.

military residence inside the fortifications. Certainly for the second part of the 4th century, the large military cemetery indicates a continued population (Mertens and Van Impe 1971). Other burials are occasionally found alongside the roads in the proximity of Oudenburg and even revealed horse burials at one point (Hollevoet 1992, 195-207; 1993, 207-216). These roads appear to have been intensively travelled, as illustrated by cart tracks (see Appendix 1), although it is difficult to deduce the extent of the traffic specifically for the Late Roman period. However, it stands to reason that these connections were at least used for military supplies and movement.

Figure 20 The site of Oudenburg with the excavation inside the fort (1) and the burial cemetery A (2) and B (3) (after Vanhoutte 2009, 10, fig. 1).

Other finds from the direct vicinity also indicate a continued use of the area in the Late Roman period. Besides the immense amount of artefacts and material from the fort and the burial, these finds include coins from Constantine at Gistel and Constantius II from Oudenburg, a small number of crossbow brooches from Jabbeke and Oudenburg and handmade pottery that has been considered to be from Germanic origin. The last is mainly found on the terrain known as Hoge Dijken in present day Roksem and Zerkegem, directly to the east of Oudenburg (De Cock, Rogge and Van Doorselaer 1987, 37-54; Hollevoet 1991, 181-196). Both roads cross through this area, indicating that it is very likely that it was an active part of the direct military and/or economic landscape around Oudenburg.

In addition to the archaeological record, the radiocarbon dates provide us with a second indication into the chronology of the direct area around this sandy ridge in the coastal plain. The 2nd and 3rd century occupation is confirmed by two ^{14}C dates between

ca. 140-320 calAD from Jabbeke (1795±30BP) and Zerkegem (1790±50BP). Next, the continuity from the Mid-Roman to the Late Roman period is confirmed by two dates ca. 255-350/380 calAD from the interior of the fort (Oudenburg-Spegelaere: 1730±25BP and 1725±25BP). Also dendrochronological dates were provided from the double well feature inside the fortifications. These showed multiple construction phases from ca. AD260 to 380/400 (Vanhoutte et al 2009, 92), confirming the validity of the radiocarbon dates. In the wider area around Oudenburg, more radiocarbon dates for the 3rd to 4th century transition were found in the recalibrations. The site of Brugge-St. Andries Refuge provided four dates between 225 and 375 calAD (1775±30BP, 1755±30BP, 1740±25BP, 1730±30BP). Also unexpected was the date from Raversijde (Oostende) ca. 250-390 calAD (1720±60BP), which derived from peat extraction pits. Two other dates from Raversijde match the Late Roman period as well spanning ca. 3550-560 calAD, although their provenance is potentially less reliable (see Appendix 1). The dates from these two sites were surprising given that no reference to Late Roman finds for either of these sites was found while compiling the Late Roman inventory. Evidently, a 3rd century date is possible, although maybe the end dates of the settlements in the direct vicinity of Oudenburg needs to be reconsidered and placed later in the 3rd century than the traditional AD260/270 date, which is tied to unproven historical events. After all, this area shows much activity in the Early Medieval period in the later 5th and early 6th century. For Oudenburg, Zerkegem, Roksem, Jabbeke and Brugge this is supported by the recalibration of radiocarbon dates from these sites (Appendix 1) (for a general chronological overview of the entire area for the Roman and Early Medieval period, see Hillewaert, Hollevoet and Ryckaert 2011).

Although the evidence for the Late Roman period has not increased much since the considerations of the Roman coast by Thoen (1978; 1987), there are indications that we might need to reconsider the classical narrative of an coast abandoned from all settlements and activities, with the exception of the forts. Arguably, the low increase in Late Roman finds for this part of Flanders, despite the numerous excavations, can fully be explained by the fixed notion of the AD260/270 end barrier. The radiocarbon dates support the notion that this entire area remained an active environment, with the focal point of the Roman fort, from the Early to Late Roman period and into the Early Middle Ages.

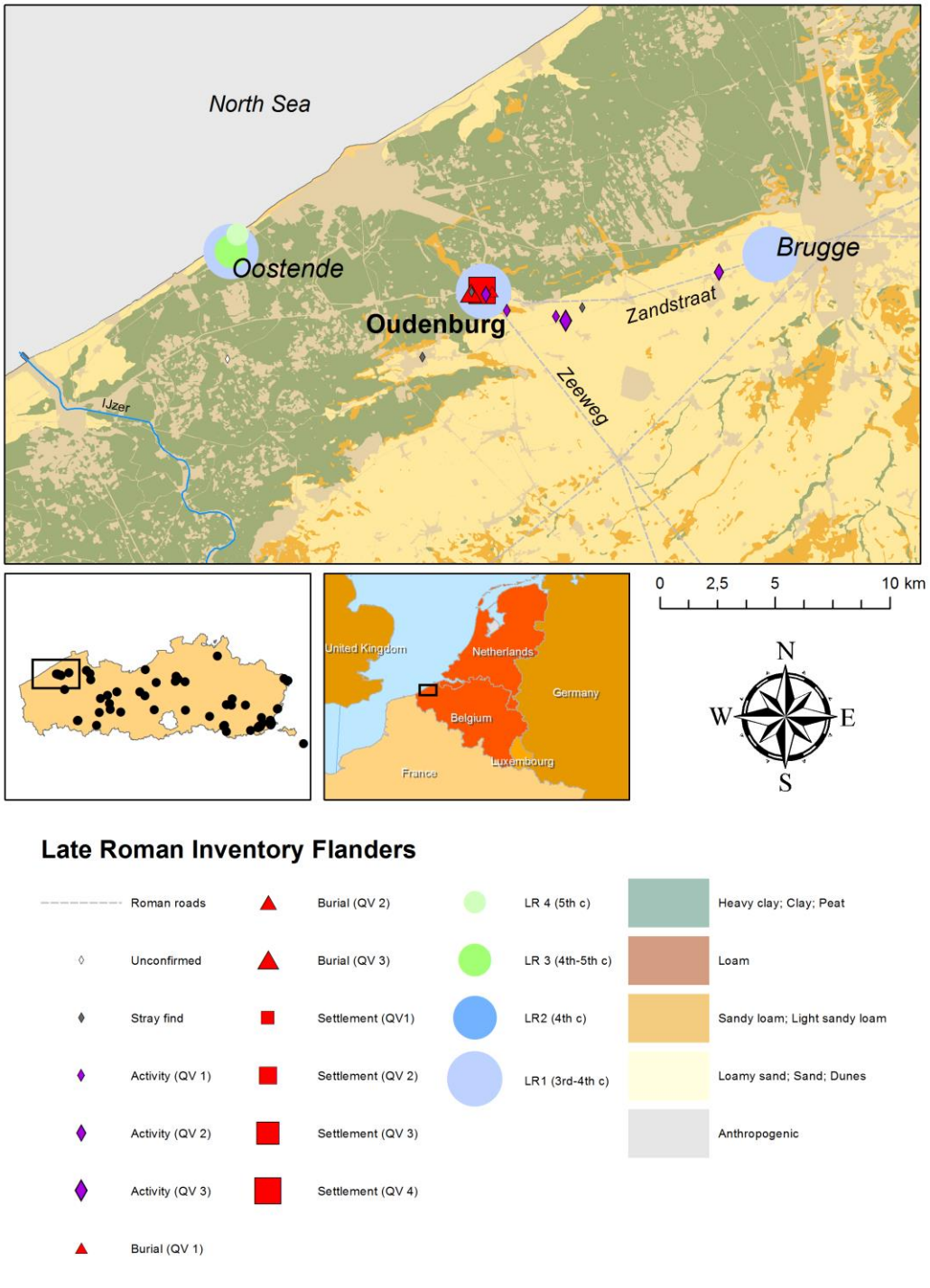


Figure 21 Area around Oudenburg: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.2 The northwestern sandy soils with tertiary height

When we consider the sandy soils inland from the area around Oudenburg and Brugge, we can start to review the area that is localised generally north of an imaginary line between Brugge and Gent. Just north of the Roman traces of Brugge, the 'Zandstraat' meets the 'Steenstraat' and the 'Antwerpse Heirbaan'. From this junction the Zandstraat continues north towards Aardenburg, the Steenstraat runs south towards Cassel and the Antwerpse Heirbaan heads off west.

Along the northern part of the Zandstraat, there is little indication of a Late Roman presence, although a recalibrated 7th to 9th century radiocarbon date (1645±45BP) from a ditch fill in Damme (DW7: Branddijk: In't Ven and De Clercq 2005, 55-56) now indicates a Late Roman date ca. 380-425 calAD. Furthermore, a few kilometres southeast of this location lies the 2nd and 3rd century Roman settlement on both sides of the Antwerpse Heirbaan (DW12: In 't Ven and De Clercq 2005, 63-64). This settlement appears to have been abandoned in the course of the 3rd century. The precise end date could not be determined more specifically and no direct 4th century evidence has been found (In 't Ven et al 2005, 47-75).

Following the presumed westward path of the Antwerpse Heirbaan, this leads to the area of Maldegem, known for its 2nd century (AD 172-175) military fort (Thoen and De Clercq 1995; Dhaeze, Thoen and Hanut 2001). In the general area, some pits were discovered containing potential Germanic handmade pottery (De Clercq 1997, 29; Crombé, et al. 2005, 93-117). The exact nature of these traces are unclear and the complete extent of archaeological features on this location has to be placed between the 3rd and 9th century (Pers. Communication W. De Clercq). A potential confirmation of Late Roman activities in the area can be delivered by two ^{14}C dates from the location of the *castellum*: Maldgem- Vakebuurt (1770±50BP) and Maldegem-Vake (1630±50BP) (Thoen and De Clercq 1995). The first date ranges from 175 to 340 calAD, whereas the second is situated between ca. 350 and 530 calAD. The former is most likely to be a confirmation for the 3rd century, but the latter points to a late 4th or 5th century date, indicating a potential Late Roman factor. Additionally, stray coin finds from the direct vicinity consist of a Postumus and a Numerianus coin (Thoen and De Clercq 1995, 15-17), confirming the late 3rd century. Finally, the unconfirmed 4th century finds from the construction of the Schipdonk channel can be mentioned, but cannot be relied on (Thoen and De Clercq 1995, 11; De Clercq 1997, 32).

A more promising area for continuity into the 4th century is further south around Knesselare-Beernem-Aalter. It has been suggested by the excavators that the fortification of Knesselare-Kouter (Figure 22) possibly was still used at the end of the 3rd century or even in the beginning of the 4th century. This is supported by two radiocarbon dates from postholes from the heavy gate tower (1775±25BP and 1765±25BP). Both the recalibrated 230-325 calAD and 240-325 calAD result did not differ much from the original calibrated dates and confirm a 3rd to 4th century chronology of the site.

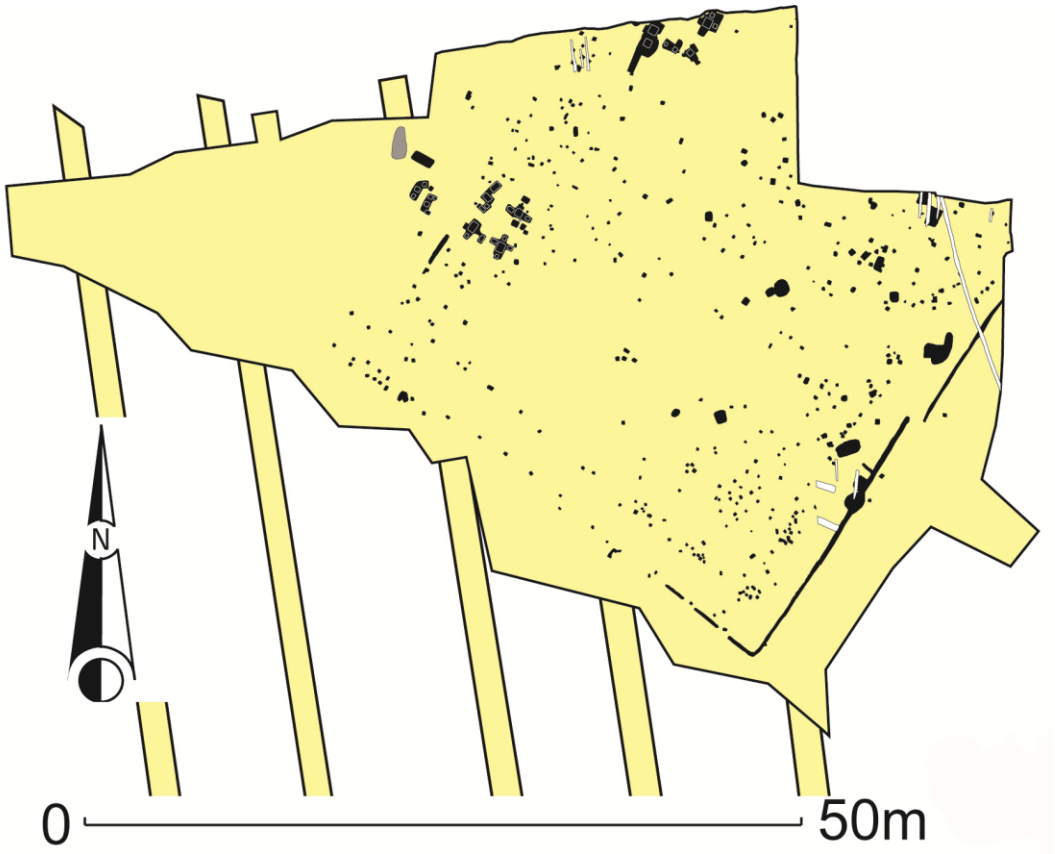


Figure 22 Excavation plan of the fortification of Knesselare (after De Clercq, Hoorne, Vanhee 2008).

Two other ^{14}C dates from the direct vicinity are in line with the results from the fortification. The location of Knesselare-Ursel provided a 235-325 calAD date from a posthole (1770±25BP) and the site of Oedelem-Wulfsberge supplied a 240-325 calAD date for a ditch (1760±25BP). One additional date from a drench pool found in Knesselare-Kluize supports a Late Roman presence between ca. 385 and 530 calAD (1630±30BP), although the chronological gap in comparison with the other results has to be acknowledged. This result, however, aligns with a date from Aalter 'Ter Walle' (1640±25BP) between 380 and 425 calAD. Besides this date, Aalter only delivered a stray find of a *Schalenurne* for a 4th or 5th century indication. Directly to the west of Aalter lies

Zomergem, which provided another radiocarbon date that fits nicely with the group from Knesselare and Oedelem, given that the fill of a ditch was dated to 240-330 calAD (1760±30BP). In the direct area of this last date, some stray finds from Nevele-Merendree consisting of a Constantine coin, a crossbow brooch and another *Schalenurne* support a 4th century dates (De Clercq 1997; 1998, 61; De Clercq and Van Dierendonck 2006, 66-67).

A final group of radiocarbon dates can be added to this area, originating from the north of Ghent around Evergem. Both large excavations of Kluizendok and Rieme-Noord revealed no Late Roman structures or finds and neither did any other excavation in Evergem to the best of our knowledge. And yet, six dates from can be placed in the same 3rd to 4th century transition group as the ones from Knesselare, Oedelem and Zomergem. Kluizendonk revealed three dates: 1775±25BP, 1755±25BP and 1745±30BP, respectively resulting in 230-350 calAD, 245-330 calAD and 250-335 calAD dates. Additionally, Evergem-Hoogstraat provided a 235-325 calAD date (1770±25BP), Evergem Polenstraat presented a 245-330 calAD result (1755±25BP) and Rieme-Noord supplied a date that could be placed ca. 245-330 calAD (1755±25BP). These dates most likely belong to the remnants of the 3rd century settlements and activities on those sites. This notion is supported by another six ^{14}C dates in our list that can be placed mainly in the 3rd century. From Kluizendok: 145-315 calAD (1795±25BP), 180-330 calAD (1780±35BP) and 175-320 calAD (1790±25BP); and from Rieme-Noord: 140-320 calAD (1795±35BP), 180-325 calAD (1785±30BP) and 215-330 calAD (1780±30BP). The only date that occurs later on, derived from Kluizendonk and has to be placed in the 5th and 6th century with a 435-590 calAD result (1525±35BP). In itself, these dates do not necessarily indicate a significant population or activity in this area. In order to confirm a Late Roman presence, supporting material culture is necessary. Nevertheless, this large amount of dates cannot simply be dismissed. Even the earliest dates have a chance to indicate a late 3rd century and early 4th century presence.

In general, this handful of stray finds and dated features lack association with significant structures with secure dating to argue a continued population in the Late Roman period. For now, it can be stated that all this evidence points to a military and/or Germanic presence in this area for the end of the 3rd century with some continued activities in the early 4th century. The active use of this landscape, but lack of settlements can be seen as tied to economic or military traffic in the region, given that the road Aardenburg-Blicquy runs through this area and multiple junctions in the road network give access to former and continued military sites: e.g. Oudenburg, Aardenburg, Maldegem, Knesselare. Although the fortification at Knesselare lies on the road to

Aardenburg, it has to be mentioned that it cannot be seen as a traditional *castellum*. The large wooden palisade and heavy gates show indeed Roman military characteristics, but there is no other confirmation of the presence of Roman regular soldiers. Nor for that matter of Germanic warriors or mercenaries. The most likely interpretations consist of either a reinforcement built by local leaders supported by state officials in reaction to crisis or instability, or a rebel fortification constructed by locals or *bagaudae* (De Clercq, Hoorne and Vanhee 2008). Perhaps an alternative interpretation on the exceptional character of the Knesselare fortification can be searched in the protection of revenue from the area. In any case, it can be argued that this area north of Brugge and Gent can be considered as a landscape consisting of axes from the coast to and from the hinterland, most likely military and/or economic in nature, given that these are not mutually exclusive.

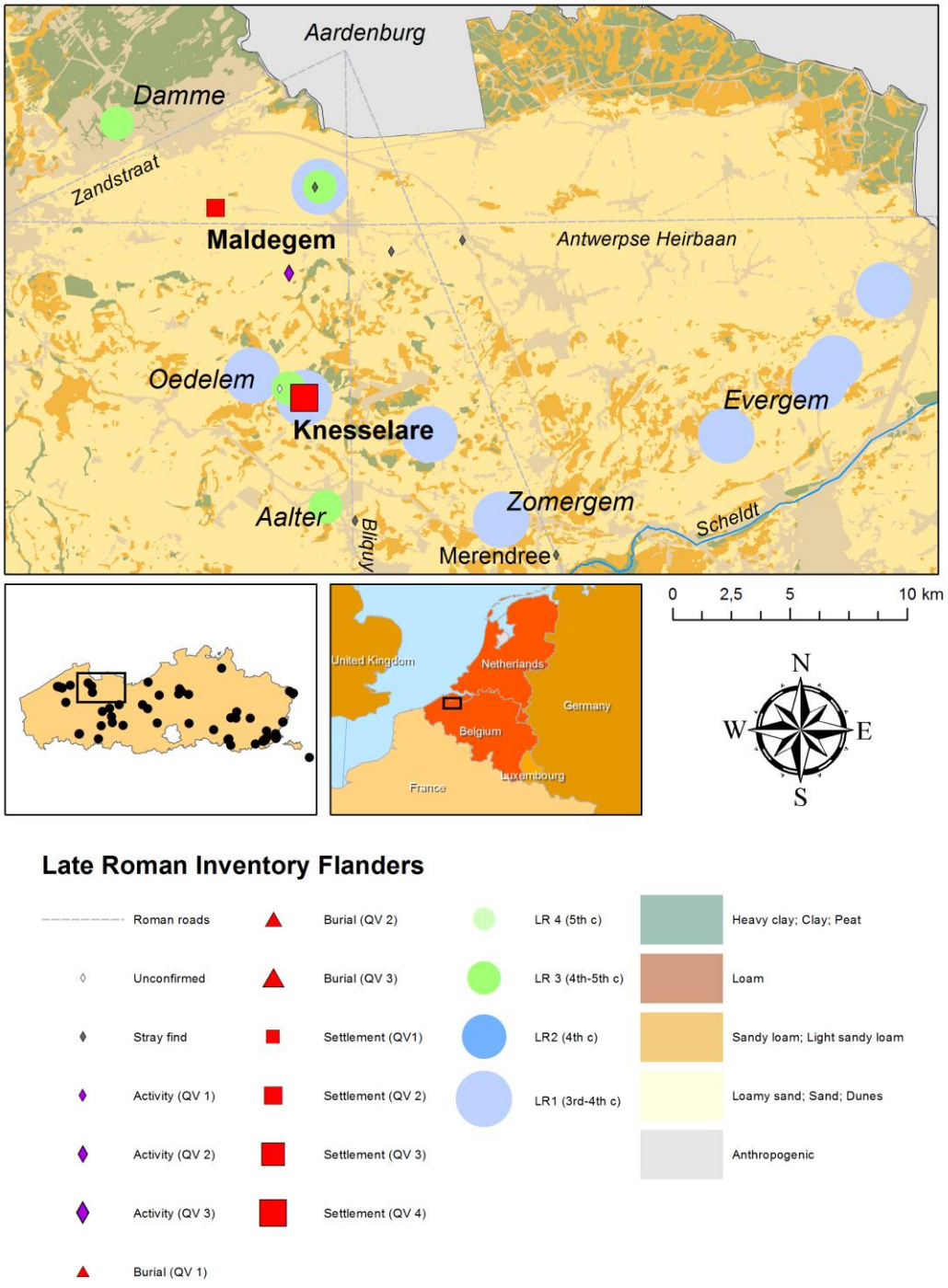


Figure 23 Area north of Bruges-Ghent: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.3 The Lys valley and the Lys-Scheldt interfluvium

Moving further west, a larger cluster of Late Roman sites and finds appears in the general Lys-Scheldt area. Here it has become quite clear that settlements along the major roads and rivers are more likely to have had a continued population from the Mid-Roman to Late Roman period or reoccupation in the later part of this final Roman phase.

Some known Roman landmarks can be briefly summarised to describe this area. The Lys connects the Late Roman settlements of Kortrijk and Gent via Sint-Martens-Latem. The Scheldt, in its turn, connects Gent to Kerkhove. Midway between these two points, Asper is located on the Scheldt and in the immediate surroundings we find Kruishoutem between the two rivers and Velzeke to the west, on the loamy soils. The rest of this area is part of the sandy soils. In addition to these two rivers, a number of major land roads can be found. Gent is connected to Kortrijk by the 'Karreweg' (Cart road) in close proximity of the right bank of the Lys. Kortrijk is connected to the large interregional road network by the road from Cassel in the west, the road south to Tournai and the eastward road towards Tongeren. Other connections are the the northeast road to Velzeke and the Zeeweg heading northwest, connecting Kortrijk and Oudenburg. Additionally a road from Oudenburg runs to Kerkhove at the left bank of the Scheldt, which continues on to Blicquy. Another road that passes in Kerkhove comes from Kruishoutem and is part of the Aardenburg-Blique axis that passes north to south through this entire area. In general, it can be stated that this area was well integrated into the Roman network of Northern Gaul both by land roads as well as by the double river connection.

The confluence of the Scheldt and the Lys in Gent was a strategic point in the landscape and therefor suspected to hold a Late Roman fort (Rogge, Thoen and Vermeulen 1990, 64, 66). The location of the St-Bavo abbey (Sint-Baafsabdij) in the St.-Macharius neighbourhood was deemed the most likely site (Figure 24). Some excavations have been carried out, but no coherent structures indicating a fortification have yet been found. Although the location yields multiple 3rd and 4th century finds, this cannot be taken as a direct indicator for the presence of a Late Roman military fort, as Van den Eynde already noted (1983, 94). Toponymic evidence has been discussed by Van den Eynde (Van den Eynde 1983, 96) and Lamarcq and Rogge (1996, 103-104). But despite the opinion of the latter that the evidence is very convincing (Lamarcq and Rogge 1996, 103), the presence of a Late Roman *castellum* remains unsupported by the archaeological evidence. Stray

finds from this location include Eifel ware and coins from Gordianus III, Postumus, Tetricus, Constantine, Valens and Valentinius III. More valuable are the few pits containing Germanic pottery (Figure 24). Unfortunately, some of the records of the excavations have disappeared and much information is lost, including these sherds.

Other indications pointing to a late 3rd and 4th century date in the region of Ghent are a coin hoard consisting of ca. 200 coins of Postumus in a samian bowl type Chenet 320 from the Valkenhof (Bauwens-Lesenne 1962, 48) and a second coin hoard from Sint-Denijs-Westrem containing coins from Valentinian I to Constantine III (Bauwens-Lesenne 1962, 188; Vermeulen 1992, 63). The latter has a closing date of AD 407-411.

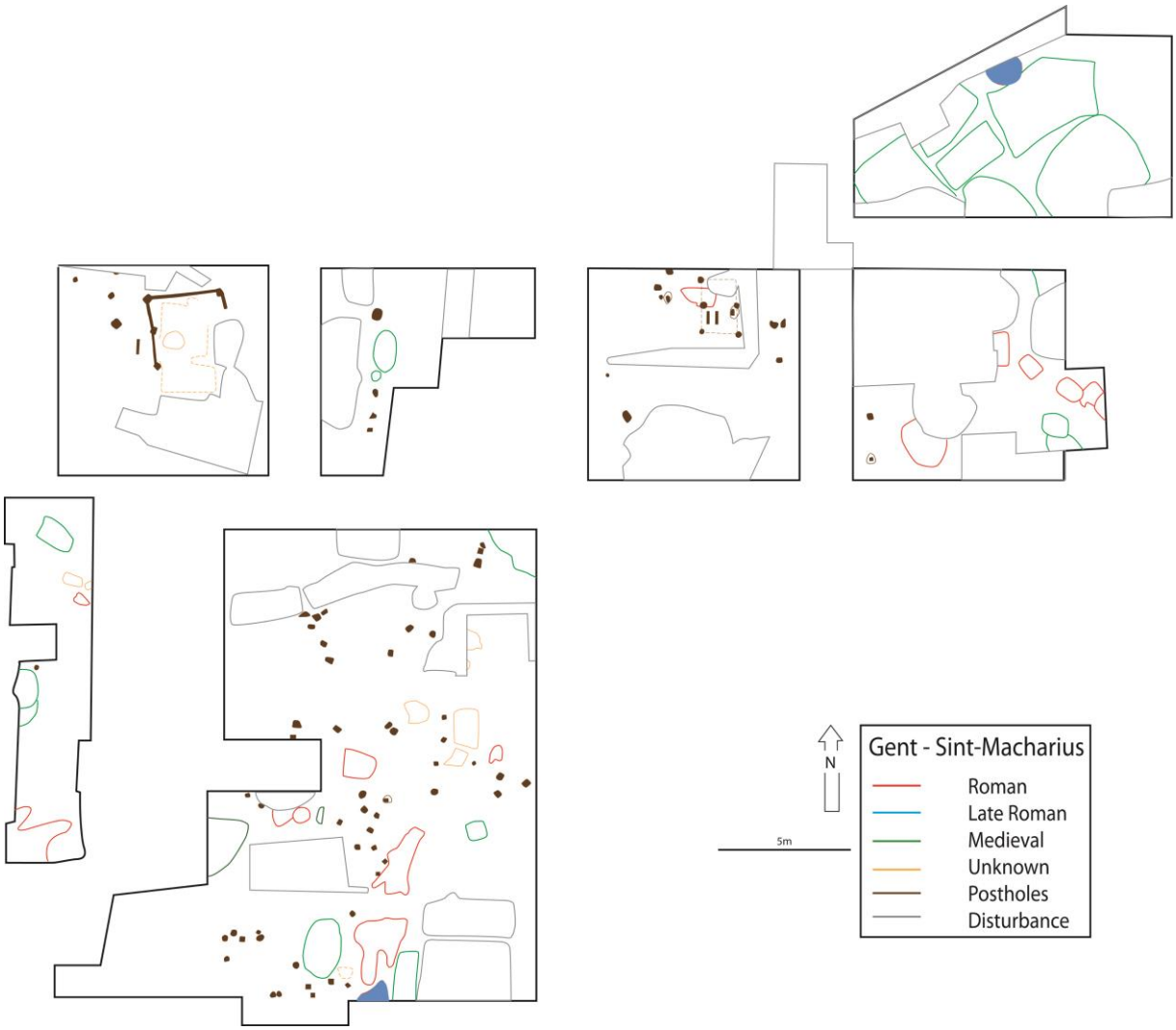


Figure 24 Excavation plan after Van den Eynde 1983, plate XIX. The two pits containing Germanic pottery are located at the north and south edges of the excavation, indicated here in blue.

A few kilometres southwest of Gent, along the Lys, lies Sint-Martens-Latem. Excavations on the site of Brakel-Torenhuis revealed an earlier Roman rural settlement

as well as two sunken huts or *Grübenhausen* (Figure 25) (Vermeulen 1983, 59-65; Vermeulen, Bourgeois and Rommelaere 1988, 90-91). A presence of Germanic people was established based on these sunken hut features and Germanic finds, such as handmade pottery (of which some sherds have been confirmed with a provenance north of the Rhine, see Chapter 6). A Theodosian coin and Eifel ware place the start of the Germanic occupation in the second half of the 4th century and the first half of the 5th century (Vermeulen 1989, 71-77; for a full discussion of the character of this site see Vermeulen 1992).

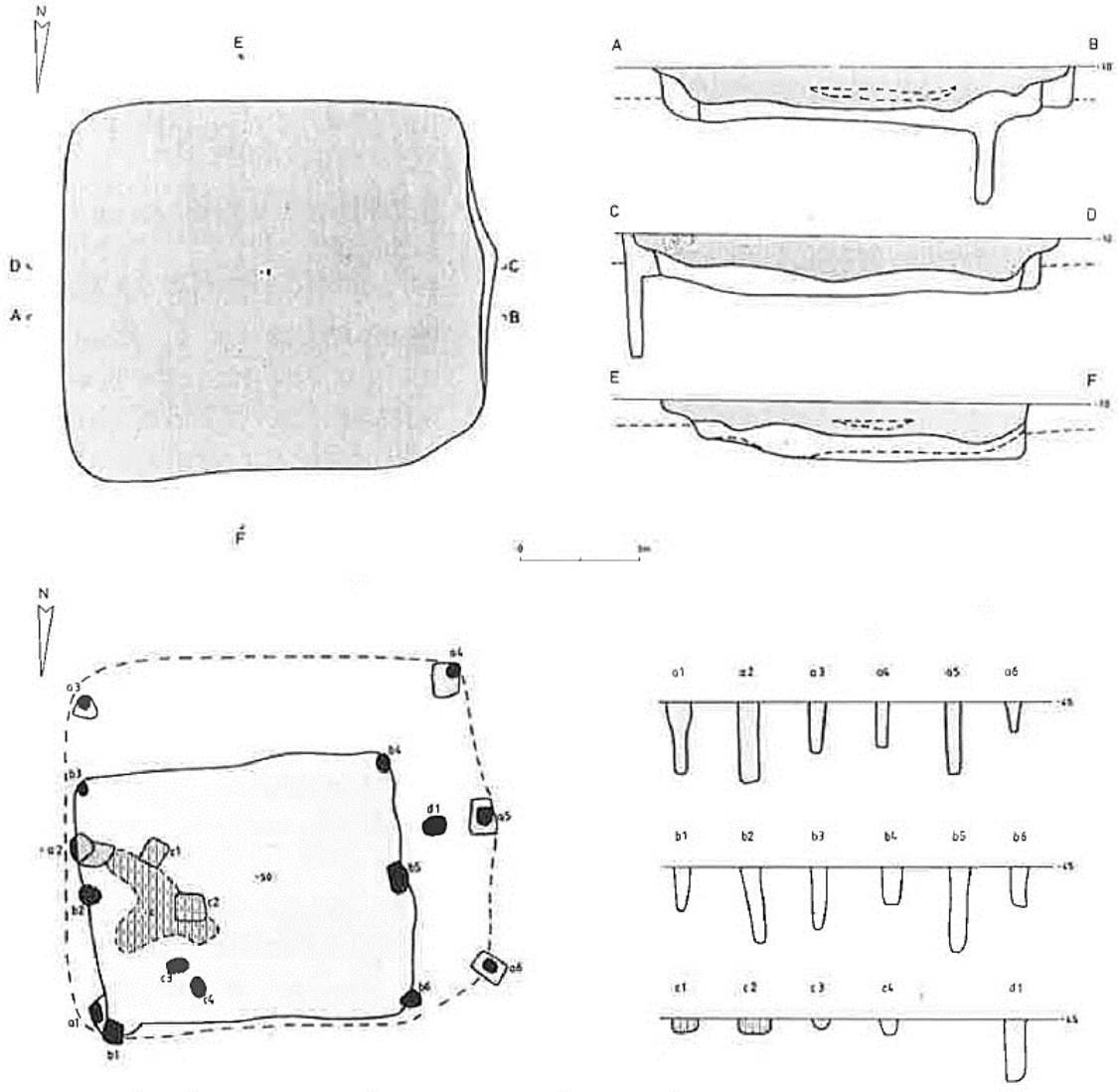


Figure 25 Sunken hut feature (90) from Sint-Martens-Latem (Vermeulen 1989, 74, fig. 46).

Not far from Sint-Martens-Latem lies Bachte-Maria-Leerne. Fieldwalking in Bachte-Maria-Leerne – Kouter yielded mainly Eifel ware and ceramic building material, suggesting a Late Roman to Early Medieval date (De Clercq 1997; De Clercq 1998, 61). More

importantly was the large pit discovered in the following excavation, which gave a 345-405 calAD radiocarbon date (1670±25BP), placing it firmly in the Late Roman period (De Clercq and Van Strydonck 2002, 3-6). This date corresponds with a radiocarbon date of 385-505 calAD from Merelbeke - Poelstraat (1635±25BP) performed on suspected Early Medieval graves. Also at Bachte-Maria-Leerne some cremation graves were found, but were too ill preserved to identify reliably (De Clercq and Van Strydonck 2002, 6).

The current excavation at Bachte-Maria-Leerne (by De Logi and Hoorne) has revealed more *in situ* information consisting of some pits and a water feature amidst an (earlier) Roman settlement. Multiple contexts have also yielded Germanic pottery, comparable with finds from Sint-Martens-Latem (the processing and studying is still ongoing).

If we move further south, we come across multiple settlement traces. The first is situated in Nazareth – Eke, on the Scheldt, where a recent excavation revealed a Roman rural settlement (Figure 26) with one house that resembles the Wijster houses type A, indicating a possible Germanic presence on the site (BAAC excavation report, forthcoming). The finds consists mainly of handmade pottery, of which two samples have been included in the petrographic study of Late Roman handmade pottery (for results and interpretation see Chapter 6). Preliminary results point to a 2nd to 3rd century rural settlement, with possible continuity to the early 4th century. This is supported by a double radiocarbon date executed on a handmade sherd from a posthole (Figure 27). The outside of this sherd was burned and contained soot and on the inside food residue was present. The food residue was dated between 130 and 260 calAD (1802±33BP) and the soot to 245-335 calAD (1749±30BP). Combined this provided a date (1773±33BP) with two distinct peaks. The 68.2% confidence level resulted in peaks of 230-260 calAD (27.2% probability) and 280-325 calAD (41.0% probability). The 95.4% confidence level resulted in peaks for 140-200 calAD (3.7% probability) and 210-340 calAD (91.7% probability). This indicates that there is a very high possibility that this structure can be placed in the second half of the 3rd century and early 4th century (Pers. Communication T. Dyselinck).

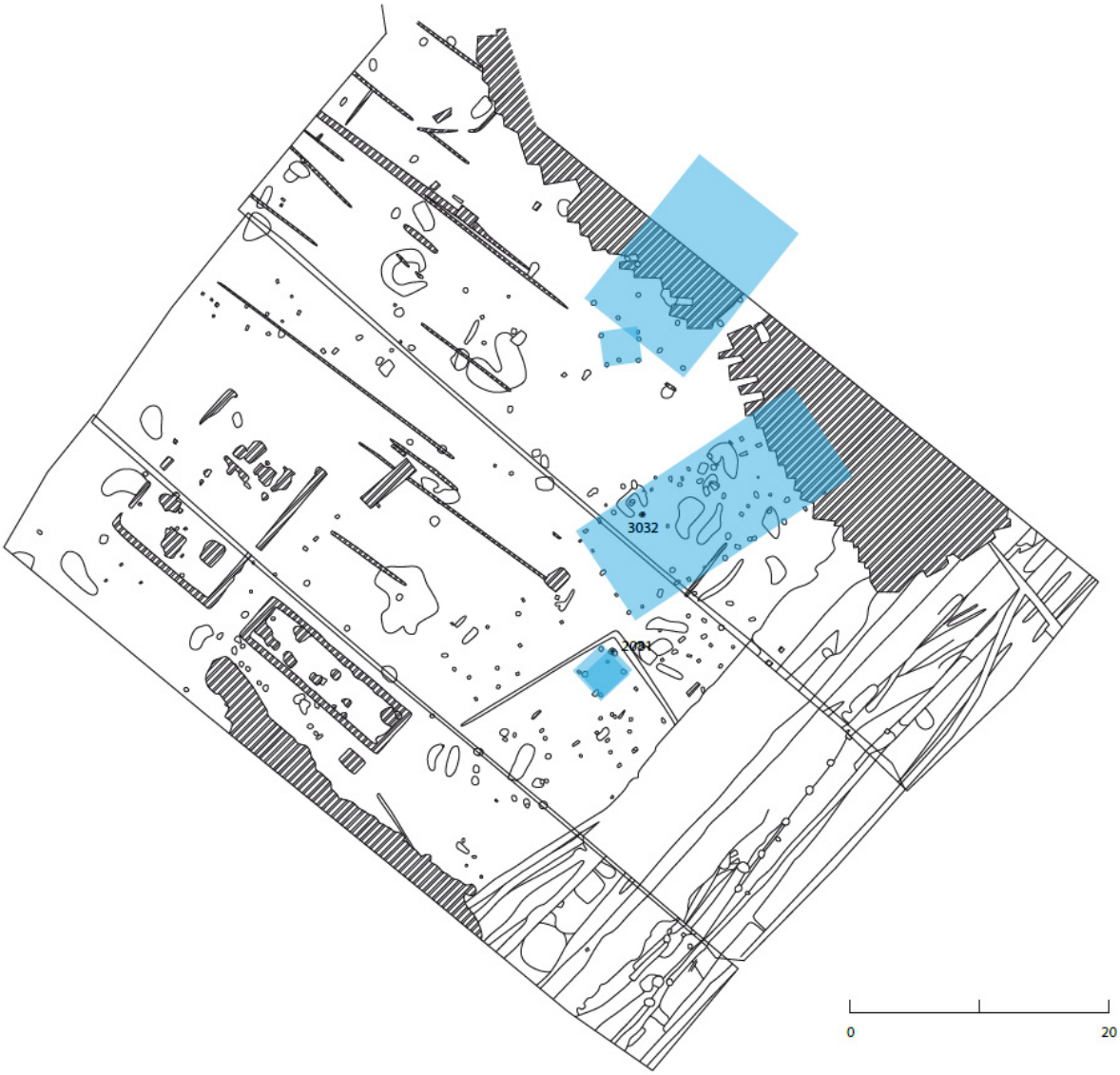


Figure 26 Nazareth – Eke – 's Gravendreef: extract of site plan containing structures in which potential Late Roman handmade pottery was found (Excavation report by T. Dyselinck, forthcoming).

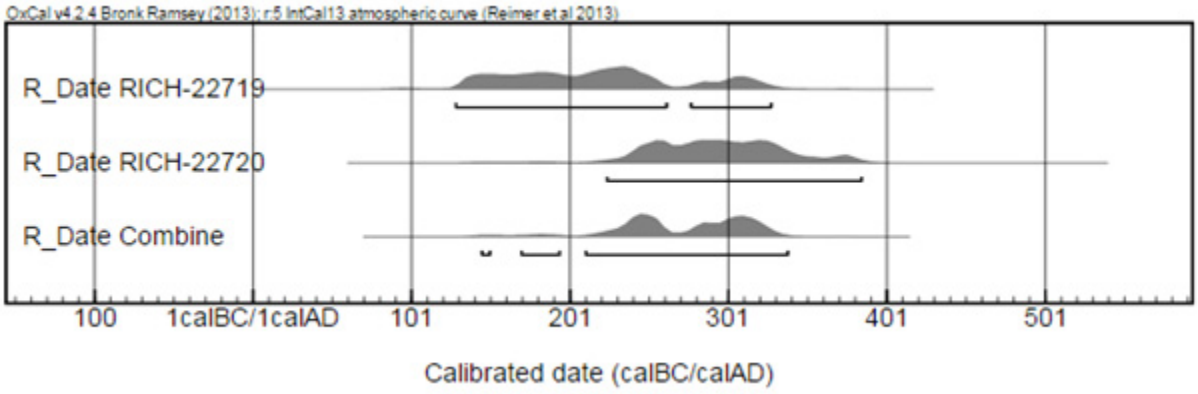


Figure 27 Calibrated combined radiocarbon date of the soot and foot residue on the handmade sherd (sample 3032) found in a posthole of the house (Excavation report by T. Dyselinck, forthcoming).

The second indication of a Late Roman settlement along the Scheldt is located in Asper. Here, a small Late Roman building was found, as well as four pits containing handmade pottery, a rim of a Late Roman terra nigra foot-vessel type Chenet 342 and a samian bowl type Chenet 320 (Vermeulen 1986, 111-117; 1992, 49-50, 242-243). The last two finds indicate a chronology in the second half of the 4th century and the first half of the 5th. Additional evidence showed that traces from the earlier Roman occupation had been levelled in this part of the terrain.

Third, Late Roman finds were found at the site of Kruishoutem where a well contained a Late Roman terra nigra foot-vessel type Chenet 342. This former central place is located in the 'interfluvium' between the Lys and Scheldt, and had a religious function that might have been carried on into the early 4th century (Vermeulen 1992). The combination of the 4th century foot-vessel and a bronze Mars statuette in the same well could indicate that (Vermeulen 1992, 136). Other finds that argue continued activities in the late 3rd and early 4th century consist of coins ranging from Postumus to Valens. Furthermore, some Germanic brooches were seen as proof that an early 5th century Germanic occupation of Kruishoutem was possible (Vermeulen, Rogge and Van Durme 1993, 172).

The fourth site, Velzeke, is located west of the Scheldt in the vicinity of Asper. The location of the former villa of Steenbeke is thought to contain a small fortification from the third quarter of the 3rd century, also known as *burgus* (Lamarcq and Rogge 1996, 89-91). Two parallel wide ditches with rampart and traces of a palisade were encountered. Based on military equipment, brooches and coins of Postumus, a date of ca. AD 275 was assigned. A recent geophysical survey revealed a circular double ditch structure (Figure 29) which connects to the former excavation (Pers. Communication T. Saes, ORBit, UGent). No other traces of possible Late Roman origin have been found here or on the location of the Roman central place.

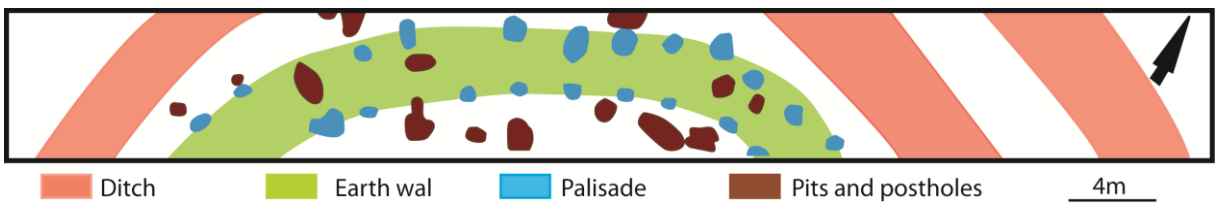


Figure 28 Fortification at Velzeke with double ditch, rampart and double palisade: suspected *burgus* ca. AD 275 (after Lamarcq and Rogge 1996, 90).

Figure 29 Recent geophysical survey by ORBit (UGent) revealed a circular double ditch structure which fits the excavated double ditch with rampart and palisade (Deschieter 2016).

A few stray finds from the general area around Asper and Velzeke support a phase in the second half of the 3rd century, such as the coin hoard from Zingem near the Scheldt containing coins from Philipp I to Postumus (Thirion 1967, 178), and a coin hoard consisting of coins from Gordianus III to Postumus from Zottegem (Thirion 1967, 87-88). Additionally, an iron lans tip and a crossbow brooch have been found (Rogge and Beeckmans 1994, 58-59), although the date of the former and the provenance of the latter are contested.

Despite the lack of 4th and 5th century structures and finds, a large series of radiocarbon dates from Velzeke point to a continued activity from the 2nd to the 5th century. In the collection of ^{14}C-dates in this study, two dates were listed for the location known as 'Kwak' with 140-320 calAD (1795±35BP) and 140-325 calAD (1790±40BP) results for two postholes. Followed by a 250-330 calAD (1750±25BP) date from the same location. This is complemented by three dates from the vicus, also pointing to a continuity from the 3rd to the 4th century with a double result of 220-335 calAD (1770±40BP) and one date for 240-

340 calAD (1750±40BP). The first two originated from a ditch on the vicus location and the latter was taken from a well. Additionally, the vicus provided a date of 240-425 cal AD (1690±80BP) on a horse bone. Furthermore, three more radiocarbon dates indicate a 4th to 5th century continuity as well. The Kwak site presented a 345-410 calAD date (1670±30BP), whereas two samples taken of mortar from a construction alteration found in the St. Martinus church resulted in a 355-415 calAD (1660±25BP) and a 415-535 calAD (1595±35BP) date. Finally, the last ^{14}C date in our list from Velzeke again originates from the vicus, where a pig bone from the bottom of a well-produced a 405-570 calAD date (1570±80BP). The only other radiocarbon date from in the vicinity from Zwalm is not very accurate with a range between 140 and 540 calAD (1686±180BP). Nevertheless, these dates indicate a large possibility of a continued population or activity in the area between Velzeke and Asper.

Further south along the Scheldt is the roadside settlement of Kerkhove, a central point in the landscape, where it is thought that surplus and revenue was stored and (re)distributed (De Cock 1996, 81). The structures at Kerkhove and the surrounding villas from the 2nd and 3rd century, however, appear to have ceased to function in the 4th century. The provided 'barbarian raids' argument of AD 260-270 (De Cock 1996, 85) is too simplistic and very doubtful, given that no evidence of destruction has been delivered, nor evidence of repopulation of the villas after these supposed raids. Additionally, a Germanic takeover is argued, based solely on the presence of one burial and some traces of a timber structure from the 4th and 5th century. Despite this poor interpretation, the presence of some Late Roman features has been noted, nonetheless. The most noteworthy is the single inhumation of a woman with a silver ring, a wooden bracelet and a Postumus coin, in the fill of a 3rd century ditch. To the excavators, these grave goods suggested a Germanic identity. Given that cremation was the preferred method of burial practice in Germanic territories (Theuws 2009, 299), the inhumation and the deposition of grave goods points very much to a Roman rite. Additionally, not much women's graves can be found across the Rhine, supporting the explanation of a Roman burial (Theuws 2009, 285: after Halsall 1992). The other Late Roman indications are traces of timber construction on top of '3rd century rubble' (Lamarcq and Rogge 1996, 131). Together with the found Eifel ware and a Constantine II coin, this points to a 4th century date for these features (De Cock and Rogge 1988, 15).

The final location in this Scheldt-Lys area is Kortrijk, or *Cortoriacum*, on the river Lys where the roads Boulogne-Tongeren and Tournai-Oudenburg cross and other smaller

roads arrive or depart (see above). This strategic landmark and the reference to a military unit called the *Cortoriacenses* in the *Notitia Dignitatum* have led scholars to believe that a Late Roman military *castellum* is buried here. For decades, the only indicators of a Late Roman occupation were finds without contextual associations, since the present day city of Kortrijk lies on top of the former Roman central place, obscuring a clear picture by only small excavations and stray finds. Approximately 20 locations with Late Roman finds in the city centre of Kortrijk are known (Despriet 1991, 91). The distribution of these finds points to a smaller nucleated settlement compared to the earlier vicus zones (Figure 30) between the Lys, the Grote Markt, the Leiestraat, Plein and the St. Maartens church (Rogge 1988, 53; Brulet 1990, 116). By the overview of Despriet (1996) the Late Roman finds consisted of: ca. 50 sherds of Argonnen samian ware, of which 15 with roulette decoration that could be dated to AD 330-360 and AD 390-420; 13 coins between AD 268-273 (Vicotrinus or Tetricus) and AD 388-402 (no identification mentioned); handmade pottery; metallic hue pottery from the Mosel area (probably Late Roman terra nigra); and imports from northern France, the Rhine and Meuse area. The *in situ* finds point to the present day Konventstraat, P. De Cockelaerestraat and the O.L.V.-church as the most likely location for the military and/or civilian Late Roman occupation (Despriet 1996, 34-37). The actual fort itself remains elusive, although the structural remains of a bath with hypocaustum at the O.L.V.-church terrain and other *in situ* contexts with 4th century material, indicates that the fort might be located here (Despriet in Hillewaert, Hollevoet and Ryckaert 2011, 73-74).

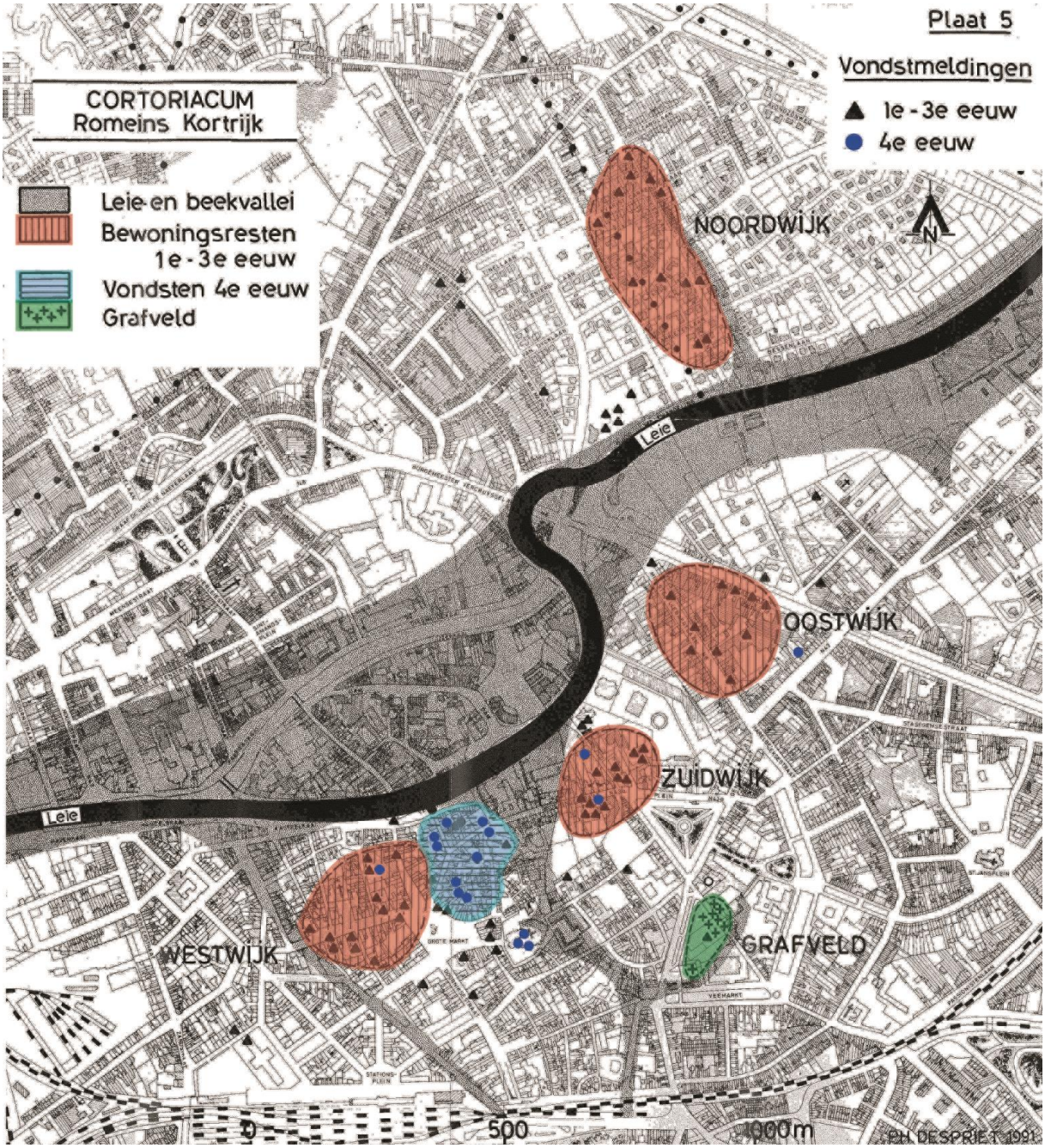


Figure 30 Cortoriacum – Roman Kortrijk: the different zones of occupation (after Despriet 1991). The Late Roman nucleus is located centrally at the river bend with horizontal stripes. The locations of Late Roman finds are marked with dots. The zones of the earlier *vicus* are marked with vertical stripes and triangles. The burial ground is located to the southeast.

The Late Roman population at Kortrijk and its connections to the rest of the provinces would have resulted in at least contemporary traffic along the rivers and roads. Indications hereof are found alongside the road to Velzeke with multiple coin finds from Valentinian, Maximian, Constantine, Theodosius and Julianus (Bauwens-Lesenne 1963, 20; Thirion 1967, 67; De Maeyer 1979, 74; De Meulemeester, et al. 1984, 49; Van Doorselaer,

et al. 1990, 22). Similarly, on the road to Gent many 3rd and 4th century coins were found in Harelbeke, as well as some Roman spolia in the St. Salvator church foundations that are thought to have been Late Roman (Ooghe, Debrabandere and Despriet 1979, 29-33, 57; De Meulemeester, et al. 1984, 49; Matton and Ferfers 1993, 10). Further, we can also mention the Constantine coin from Izegem along the road to Oudenburg (Bauwens-Lesenne 1963, 49) and the coin hoard further south along the Lys in Menen consisting of coins from Gordianus III to Severus II with a closing date of AD 306-307 (Thirion 1967, 106).

In general for the Late Roman Scheldt-Lys area, it can be concluded that there is no question to activities continuing from the 3rd century into the 4th and 5th century, and possibly further into the Early Middle ages. During the entire Roman period this was a well-connected region, and remained so in the Late Roman phase. The Scheldt and Lys provided easy access for military and economic traffic, and the many roads created a high degree of connectivity with the administrative centres and military points in other parts of Northern Gaul such as Boulogne, Cassel, Blicquy and Tournai not much further south. Additionally, the south part of this area might have been in contact with the remnants of the villa-landscape at the end of the 3rd century. Possibly a local or provincial elite still resided in the general region, increasing access to resources and networks, for instance to the Argonne and Eifel region. However, this is highly speculative at this point. In any case, a military presence can be argued. Not so much as a continuous standing army residing in the direct area, but more the traffic of troops and supplies that went to Oudenburg and Aardenburg and possibly the occupation of some strategic landmarks at the rives and road junctions. The case of *Cortoriacum* (Kortrijk) improves with every find, although the actual remnants of a fortification remain elusive, as is the case for *Gandavum* (Gent). Additionally, the defensive structures at Velzeke might indicate a military presence, although there is not yet a clear image of its actual extent and nature. As we have seen for Knesselare, a fortification might be constructed in a Roman way without representing official Roman troops.

Nevertheless, an occasional military presence in the general area can be assumed and in which case a local state administrative network would have been required for the logistics, communication and distribution of supplies. Good candidates are the potential military sites of Kortrijk, Gent and Velzeke, but also some former central places along the rivers and roads. Again we can suggest Kortrijk and Velzeke and additionally perhaps Kruishoutem as well. Its religious function might have been a supportive factor for its

continuity while other settlements were slowly abandoned. Furthmore, the opportune elevated topographical location of Kruishoutem might have attributed to a continued military presence, given that both Gent and Kortrijk are visible from this site (Pers. Communication F. Vermeulen).

Admittedly, the majority of the region has to be characterised as a rural landscape. Some continuities from the 3rd century have been indicated by the radiocarbon dates, such as Nazareth and Velzeke, or by the nature of the finds from the wider area, which also includes the general area around Gent, Kortrijk and Velzeke. Besides the known and 'well-visible' former central places, the recently excavated site of Nazareth suggests that there might have been a number of (continued) solitary small communities with only one or two houses and some smaller secondary buildings (families?) at the end of the 3rd century and the early 4th century. These small settlements would remain fairly invisible in the larger landscape without large-scale excavations and could explain why not many have been found.

For the second part of the Late Roman period, ca. AD 350-450, more information is available for the rural communities from the sites of Sint-Martens-Latem, Asper, Kruishoutem and Bachte-Maria-Leerne. The traditional Frankish take-over has been already been proven problematic by Vermeulen (1992). Nonetheless, Germanic structures and material culture have been encountered such as the sunken hut feature at Sint-Martens-Latem, the brooches at Kruishoutem and additionally the non-indigenous handmade pottery from Gent, Bachte-Maria-Leerne, Nazareth, Asper and Kortrijk. The term 'non-indigenous handmade pottery' is deliberately chosen here above 'Germanic pottery' for reasons related to the longstanding tradition of the ethnicity discourse and unfamiliarity with this material category (see Chapter 2). This does not, however, imply that there was no such thing as Germanic pottery. This cannot be denied and has been confirmed, but the reality is far more complex than the mere unilateral repopulation by Germanic people at the end of the 4th century. In almost every case, Roman imported pottery from the Argonne and Eifel region is associated with the Germanic material and structures. Furthermore, the radiocarbon date at Nazareth suggest an earlier presence of Germanic people or material, already at the end of the 3rd century. Moreover, the burial of Kerkhove, more likely to be Roman than Germanic, demonstrates that much has to be re-evaluated and that the Late Roman (rural) communities have to be redefined in terms of recognisability and identification.

In general, the entire Scheldt-Lys area can be regarded as an active part of the provincial society of Northern Gaul with a sustained connectivity, a mainly rural-orientated landscape of mixed Gallo-Roman and Germanic population with the presence of the military, either as occupation or traffic, and the accompanying state-related administration.

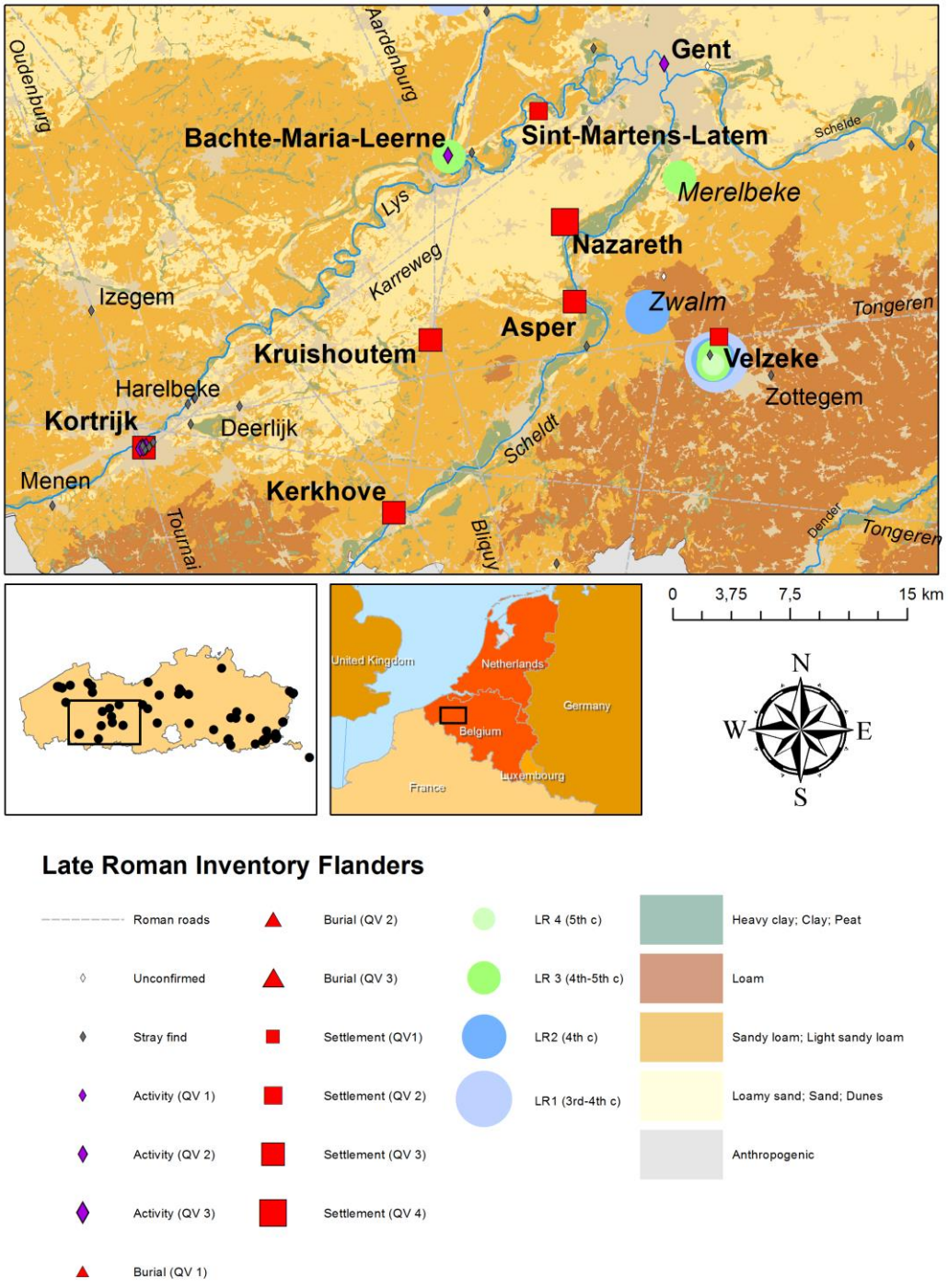


Figure 31 Scheldt-Lys area: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.4 Central Flemish river area: the maritime Scheldt and its tributaries

When we move to the more central part of Flanders and continue to follow the Scheldt northeast from Gent, some dispersed Late Roman features become visible. The first Late Roman find is found at the location of the 2nd and 3rd the settlement of Zele (In 't Ven and De Clercq 2005, 90-91). Here a large amount of Germanic pottery was found in a pit dating to the second half of the 3rd century and the early 4th century. These ceramics resembled the material culture in the 'Frisian' area of the northern Netherlands. It was suggested that a short Germanic occupation was present here at the end of the 3rd century. (De Clercq and Taayke 2004, 57-71; In 't Ven and De Clercq 2005, 209-213).

A small distance to the southeast, more Germanic evidence has been found at Dendermonde, right before the river Dender flows into the Scheldt. On the location of a Merovingian cemetery (Zwijvekekouter), multiple Late Roman objects were found, including Eifel ware, Thuringian brooches, 'Saxon' pottery and handmade pottery, which all points to the 4th and 5th century. Van Doorselaer and Opsteyn (1999, 187-191) suggested that the Germanic presence in the Scheldt region could not only be related to immigration, but also could be seen as the presence of Germanic soldiers in the Roman army. More recently, at the site of 'Oud Klooster' a well was found containing handmade and Eifel ceramics, and was dated by radiocarbon to ca. 254-376 calAD (1730±30BP) (Demey 2012), supporting the notion of an active Late Roman society in this area. Furthermore, two radiocarbon dates further south along the Dender from Aalst can be mentioned. Underneath a medieval ditch, some postholes were found and date to 355-505 calAD (1640±30BP) and 410-535 calAD (1600±30BP). These results support activity in the 4th and 5th century in the area, although no other finds are known from the Dender region. Only in the wider area, some 4th century coin finds, a possible 4th century tile structure and a dark earth layer are known from the former vicus of Asse (Cumont 1905a, 104-105; Desittere 1963, 5-6; De Beenhouwer and Magerman 2011, 10-11), as well as a single Postumus coin from Roosdaal, but neither of these sites are situated along the course of the river (Cumont 1905b, 482; Desittere 1963, 138-139).

More Germanic finds can be listed from the immediate vicinity, of which the most notorious is the 'Saxon' figurehead found while dredging the Scheldt near Appels. The original ^{14}C analyses resulted in a fairly inaccurate result of 1550±105BP, giving a recalibration of a 405-605 calAD (Barker, Burleigh and Meeks 1971, 158). Combined with

dendrochronology, this wooden artefact was placed in the 4th or 5th century (Van Doorselaer and Opsteyn 1999, 192). Additionally, the two Wijster hairpins found while dredging the Scheldt near Wichelen also point to a Germanic presence in the 4th and 5th century (Verlaeckt 1995, 32-34; 1996).

Continuing on the Scheldt, the 4th century square well of Temse revealed a Late Roman terra nigra foot-vessel of type Chenet 342. No other indications of Late Roman activities were made during its discovery in 1956 (Thoen 1966, 102-103). The general area is located on the Rupelian clay and was thought to have been an 'industrious' area during the Roman period and the association of the well with a certain craft was suggested (Thoen 1966, 100-102; Thoen, et al. 1989, 74-75).

This brings us to the Scheldt confluence area, where the Durme and Rupel flow into the Scheldt. First, at the west side of this confluence, no other direct indications of Late Roman population or activity are present. Although Sint-Gillis-Waas was thought to have been a Late Roman settlement (Van Hove and Van Roeyen 1990, 30-37; Hollevoet and Van Roeyen 1992, 209-221; 1995, 419-444), De Clercq more recently re-evaluated the house construction technique and argued a Mid-Roman date (De Clercq 2009, 5-11). The additional supposed Late Roman finds consisted of handmade pottery with grog and grass temper. The former is now known to have been a local indigenous tradition for the entire Roman period (De Clercq 2009 and see Chapter 6) and the latter is often considered to be *chaff-tempered-ware* associated with the 'Migration period', although plant temper also sporadically occurs throughout the entire Roman period as a local technique. The interpretation at Sint-Gillis-Waas has much in common with the interpretation of the 'Germanic' burial at Kerkhove: often when Roman material culture is not familiar, it is deemed Germanic and by such has to be placed in the Late Roman period. This is a dangerous reasoning that warns us to look for other indicators before making such assumptions regarding unfamiliar material in a Roman chronology. Potentially the site of Sint-Gillis-Waas continues on into the end of the 3rd century, but that cannot be confirmed at this point.

Still, many Late Roman stray finds in the general area indicate a late 3rd to 5th century activity in the landscape, such as multiple coin hoards and finds: in Lokeren a coin hoard containing Postumus coins was found (Thirion 1967, 110); somewhat further at Zeveneken another coin hoard contained examples of Constans II (Thirion 1967, 110); at Temse ca. 20 Constantinian coins were discovered; and at St. Amands coins were found

from Gallienus, to Tetricus, Maximian and Constantine (Thirion 1967, 147; Segers 1988, 24).

Additionally in St. Amands, another 'Saxon' figurehead was found in the Scheldt around Moerzeke-Mariekerke. Radiocarbon dating puts it ca. 395-545 calAD (1598±70BP) (Barker, Burleigh and Meeks 1971, 157; Segers 2001, 23-26). Other ^{14}C dates from the area west of the Scheldt-Durme-Rupel confluence support a Late Roman chronology as well. A 3rd to 4th century date comes from Waasmunster-Pontrave, where the fill of a burial chamber was dated by two samples to 235-325 calAD (1770±25BP) and 335-400 calAD (1685±30BP). Furthermore, a radiocarbon date on a sample of spoliated Roman mortar from the Holy Cross-church at Vrasene revealed a 405-535 calAD date (1600±60BP). Stray finds of Eifel ware seem supportive of a 4th to 5th century date (Van Hove 1995, 467-468). Also, field prospections in the Scheldt-Rupel area delivered multiple finds of Eifel ware, such as Bornem-Luipegem, Bornem-Eigenvliet, Bornem-Heek and Ruisbroek-Sauvegarde (Segers 1988, 2001).

Second, at the east side of the Scheldt-Durme-Rupel confluence direct evidence of Late Roman population and activity becomes more dispersed. Between the Scheldt, Rupel and Nete, some wells with Late Roman finds or dates have been found. The first is the well at Kontich which, much like the one from Temse, was excavated early in the 20th century and no other Late Roman indications other than the well itself are known. This feature was put in the 3rd or 4th century based on the samian bowl found in its fill (Van Passen 1964, 37; Bauwens-Lesenne 1965, 89; Anseeuw 1987, 107). Just northeast from Kontich, two more wells were found among the 6th century rural settlement of Hove. Based on two radiocarbon dates, they can be placed in the 5th century. The first date was obtained from a first construction phase and gave a result of 430-575 calAD (1530±30BP), whereas the second one could be placed between ca. 420 and 535 calAD (1590±40BP). In addition to the well, some unspecified Late Roman stray finds were mentioned as well as a small secondary building that resembled small structures encountered on the settlement of Wijster (north of the Rhine), indicating possibly an additional Late Roman feature (Verhaert and Annaert 2003, 72).

Directly to the north of these two locations, some investigation in Mortsel delivered a series of pits with Roman material. One of these contained Germanic handmade pottery and was dated to the 3rd or 4th century based on parallels with the material from Donk (Verstappen 2000, 89-94). Two samples were taken from the Germanic pottery, of which one proved of a non-local origin (see Chapter 6). Despite the confirmation of non-

indigenous ceramics, the petrography does not allow for an adjustment of the chronology. For now, we suggest a 3rd to 5th century date.

A few kilometres to the east, some Late Roman finds derive from Lier, which is located on the Nete. Excavations found a ditch with Eifel and handmade pottery, as well as a group of postholes and a hearth that also might be associated with the ditch (Bruggeman, Van Celst and Reyns 2012, 23-25, 32-34). Late Roman activity in and around Lier are supported by the large coin hoard found in 1937, containing ca. 4000 coins of which the 4th century examples range from Constantine to Honorius, of which the latter is the closing coin (Lallemand 1965a; 1968). These two Late Roman indications are supported by the stray find of a crossbow brooch of type 3/4 according to the typology of Keller-Pröttel-Swift (Annaert 1999, 13-14).

To the south of the Nete, flows the Dijle, along which some sporadic stray finds are known. First, at the Varkensstraat in Mechelen a Theodosian coin was found (Sevenants 1987, 209), further east along the river a coin hoard containing bronze coins from Constantius (AD 305-306) or Constans (AD 337-350) were found in Rijmenam. Additionally, some golden coins of Constantine (AD 307-337) were found in the direct vicinity (Bauwens-Lesenne 1965, 148-149). And at a third location, near Betekom, some Constantinian coins were found as well (Thirion 1967, 53). No other archaeological evidence has surfaced, despite the connection of the Dijle with the Demer, along which multiple Late Roman settlements have been found (see 4.3.5).

The only evidence of a Late Roman population in the wider vicinity is Erps-Kwerps further south along the road from Kontich to Namur, just below the former vicus of Elewijt[6]. Based on archaeo-botanical analyses on the fill of a well, it was reconstructed that a Late Roman reoccupation of the former villa estate had taken place. The results indicated that the surrounding area was cleared in order to prepare for cultivation (Lentacker, et al. 1992, 110-131). A series of other indirect evidence such as a kiln or oven, traces indicating stone recuperation from roads and a ditch system were stratigraphically placed post-dating the villa occupation (Verbeeck 1994, 67-90). It was noted that the handmade pottery might suggest Germanic inhabitants. This would be comparable with

[6] Evidence is lacking to prolong the occupation at Elewijt to the late 3rd century. Noteworthy is the established presence of Germanic people ca. AD 200 by means of handmade pottery (Van Impe 2005, 287-302).

the reoccupied settlements further towards the east, although concrete evidence is lacking to be certain.

Before moving further east and south in this review, there are some possible Late Roman radiocarbon dates from along the Scheldt to the north of these features. The closest to the Scheldt is the Wilgenhoeve at Ekeren, of which two postholes delivered a 3rd to 4th century date by 250-330 calAD (1745±25BP) and 260-380 calAD (1720±30BP). A second series of dates is provided by wells from three different locations, which point to a continuity from the 4th to the 5th and 6th century. The only date that completely falls within the Late Roman parameters derived from the Houtlaan, giving a date of 340-410 calAD (1670±35BP). The other wells from Steenakker and the Blikstraat rather indicate an Early Medieval date, although a mid-5th century results potentially can be related to the Late Roman phase. The five radiocarbon dates gave the following results: 423-535 calAD (1585±30BP), 426-535 calAD (1580±25BP), 430-565 calAD (1540±35BP), 434-585 calAd (1525±30BP) and 435-582 calAD (1525±25BP). Unfortunately, similar to the ^{14}C dates from Aalst and Waasmunster, no corresponding Late Roman archaeological features or finds are present or have not been identified at these sites.

It is difficult to obtain a clear image of the activities in the Late Roman phase in this area, due to the solitary nature of the *in situ* evidence that mainly derives from old excavations and the incongruity between the radiocarbon dates and the chronology from the archaeological record. A possible explanation can be found in the dating and identification issues of continued local (Late) Roman settlements as well as contextualising the Germanic finds. Regarding the old excavations and finds, such as the wells of Kontich and Temse, neither Late Roman aspects were well-known in that time and would not have been considered to belong to the 4th century without respectively the samian ware and the Late Roman terra nigra foot-vessel. Not only in the earlier excavations, but in most of the archaeological record in this area, only the presence of Argonne samian ware, Eifel ware or coins were accepted as Late Roman indicators. Normally, the same holds true for Germanic finds as well. In the area around Antwerp, however, the Merovingian period has received much attention, resulting in an allocation of 5th and 6th century dates to Germanic material as well. Especially on Early Medieval sites, such as the 8th century site of Hove, where the potential Late Roman aspect only received minor attention, despite indications towards the early 5th century. Of course, this is again tied to the historical interpretation that the Roman period ended ca. AD 410 for Northern Gaul, leaving the most of the 5th century as a chronological hiatus that does not

really belong to the Roman or the Merovingian period. Finally, we can add the poor preservation of timber construction to the list of issues, as well as the difficulty in chronological identification of local handmade pottery. Both factors complicate the locating and identification of Late Roman settlements in this area.

Nonetheless, some information is present and can be used constructively. First of all, it appears that the local settlements from earlier on in the Roman period have been abandoned. Only the dispersed wells indicate any kind of population or activity in the area, with the exception of the short Germanic occupation in Zele at the start of the Late Roman phase. Additionally, the coin hoards, as well as the separate coin finds and distribution of Eifel ware, confirm the presence of active people especially along the rivers in the 4th century. The lack of 4th century settlements in combination with the collection of Germanic finds suggests that the local population was no longer present, or at largely diminished numbers in comparison to the 2nd and 3rd century. Despite the many rivers running through the landscape, this area along the Scheldt appears to be less well-connected to the interregional network of Northern Gaul than its southern counterpart. For instance, fewer roads are known: the Antwerpse Heirbaan arrives somewhere around Sint-Gillis-Waas in this area and possibly connects to another road north of Kontich that runs south and splits into a road leading to Asse- Blicquy and a road headed for Namur. This is of course the representation of the state of research, possibly more roads are yet to be found. Additionally, a connection to Tongeren might have run via the Rupel-Dijle-Demer. In all, the presence of fewer roads, as well as the larger distance to the Rhine frontier and the militarised south of Northern Gaul, can be argued to indicate a lack of military traffic, which would have resulted in less interregional trade and less attention from the state.

Furthermore, the Germanic presence at Zele and Dendermonde, and the nature of the Schelde finds, suggests that these people came from the north of the Netherlands, be they Frisian, Saxon or Frank in nature. The chronological spread indicates their presence from the late 3rd century onwards, although the lack of settlements argues against a continued population. Perhaps we need to take the suggestion of Germanic soldiers in the Late Roman army from Van Doorselaer and Opsteyn (1999) into consideration.

In general, it can be stated that the area in central Flanders along the Scheldt and its tributaries was a less active area than the Scheldt-Lys area in Late Roman. Possibly due to the lack of a military presence or sufficient connectivity to an economic network to sustain the local rural communities. Dispersed settlements were definitely present, as

indicated by the solitary structures, coin hoards and stray finds. These sites might have been Germanic in nature, either representing rural immigrants or soldiers and most likely consisting of short occupations, although more research is required to make a definite statement. In the course of the 5th century, more evidence is present for an continuous population that is potentially transformed into the later Merovingian phase.

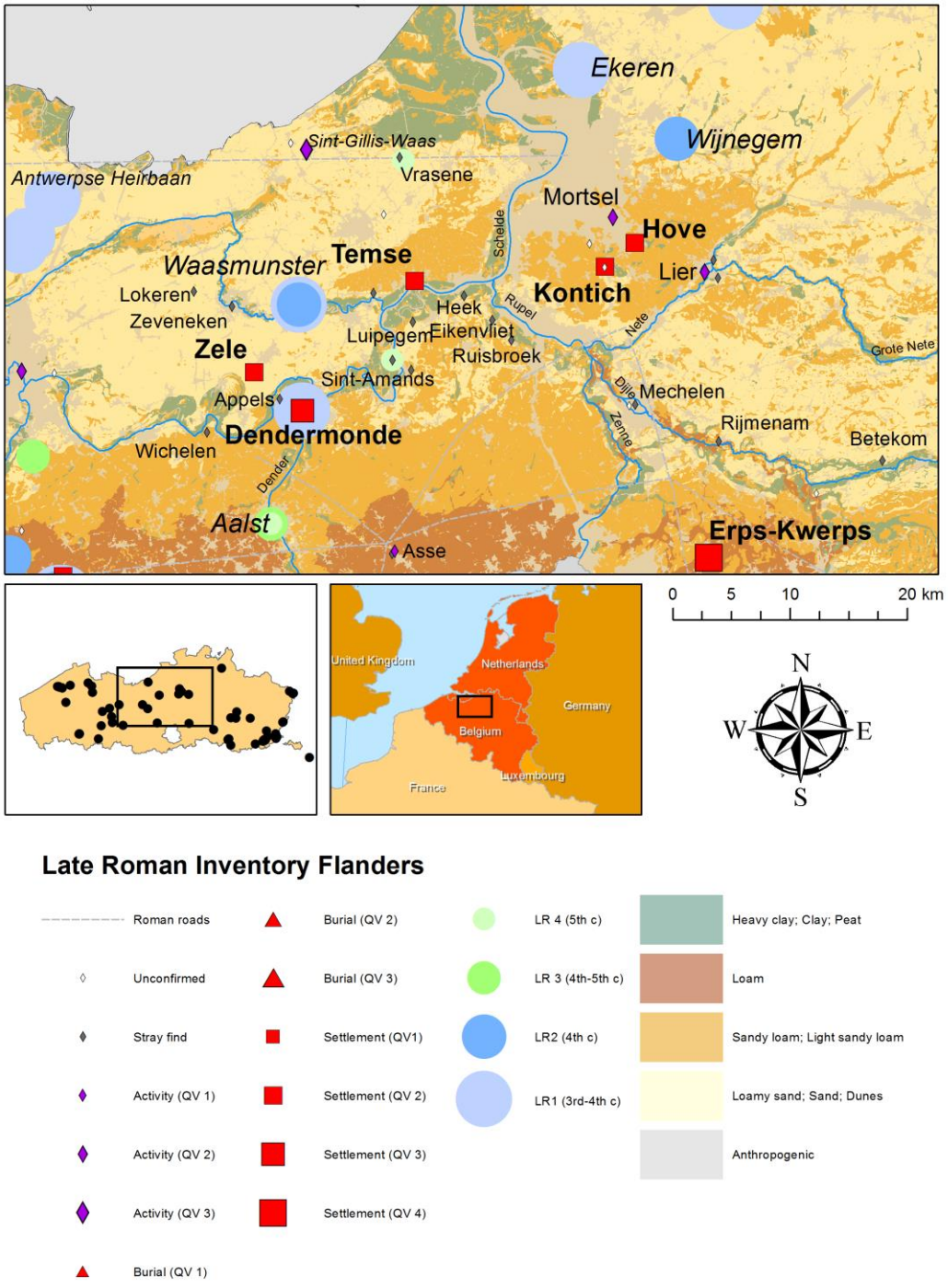


Figure 32 Central Flanders river area: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.5 The loamy plateau between the rivers Nete and Meuse

4.3.5.1 The urban centre of Tongeren and its immediate surroundings

The eastern part of Flanders is situated in the province of Germania Secunda in which Tongeren is the most significant Late Roman site for this study area. Where Germania Secunda ends and Belgica Secunda begins is not clear, although the division runs through Flanders. In this part, we will focus on the area that is most definitely part of Germania Secunda and focuses on the Late Roman town of Tongeren and the surrounding settlements.

Tongeren or *Atuatuca Tongrorum* was the *civitas* capital for the *Tungri* in the 1st century, after which the province name changed to Gallia Belgica and Germania Inferior until the reformations by Diocletian at the 3rd-4th century transition. Somewhere along the 2nd or 3rd century, Tongeren received a municipal status, after which it remained one of the most important urban centres in the Late Roman province of Germania Secunda, and arguably of Northern Gaul. The literary sources that mention this town comprise of the work of Ammianus Marcellinus, the Notitia Dignitatum and the Notitia Galliarum. According to Ammianus, *caesar* Julian met with the 'Salian Franks' here in AD 358 to confer on their illegal residence in Toxandria. Ammianus described Tongeren as a large and prosperous town. Furthermore, it is known that Servatius was the Bishop of the Tungri in the mid-4th century, who presumably belonged to the elite class of Northern Gaul. Moreover, a military presence is assumed, based on references to the multiple units of Tungri that were possibly part of the *comitatenses*, i.e. the field army, that defended the province (for a detailed overview, see Vanderhoeven 2012, 138; Vanderhoeven in press).

This former *caput civitatis* was located in a landscape mainly consisting of fertile loam alongside the river Jeker and in close proximity to the Meuse and Demer. The surrounding landscape was filled with prosperous villas until the 3rd century, which was the agricultural base for the urban wealth. Additionally, Tongeren was connected to the interregional network by roads leading to Nijmegen, Cassel and Boulogne, Trier and Metz. Some minor roads going further into the sandy hinterland can also be mentioned, such as the roads to Kortrijk and Asse. The Jeker was directly accessible and led to the military fort of Maastricht, where it connects to the Meuse. It has been hypothesised that a harbour was located on the Jeker bank (Vanderhoeven 2012, 135-136).

The urban topography inside the enclosure consisted of the major public and official centre in the northern part of the town, which is the most elevated and enclosed by both

the 2nd and 4th century walls. Although a forum is still lacking, a temple was found on this location. The slopes running towards the Jeker were mainly filled with urban residencies and some craft activities for the better of the Early and Mid-Roman period. The evidence of the Late Roman period is less abundant, although it appears that there is a stark contrast inside the 4th century wall between the densely populated eastern part of the town with large urban buildings and the mainly empty western part. In the west no Late Roman buildings have yet been found, only occassional finds. In the eastern part, a series of excavations at the Vermeulenstraat and the Church of Our Ladies have revealed a part of a Late Roman urban insula. Two rich *domus* structures were found at the Vermeulenstraat, separated by a wooden palisade, and recently a possible bath has also been found on the same insula. Large-scale excavations underneath the Church of Our Ladies revealed the remnants of the 4th century basilica, which was built on earlier *domus* buildings that were destroyed by fire. The construction of this basilica is placed in mid-4th century, based on coins from Constantine and Crispus, ca. AD 320-380, and a series of radiocarbon dates which combined resulted in a 250-330 calAD date. In a second phase at the end of the 4th century or beginning of the 5th, the apse was enlarged. Its function is not yet certain, although much of the evidence can be argued to represent an early Christian church. In any case, it appears that the building was well maintained and in continuous use throughout the 5th and 6th century. After which the existing structures are used and partially replaced to build a Merovingian church. In contrast with the continuity of the basilica, most of the town appears to have been discontinued in the second half of the 5th century (Vanderhoeven in press).

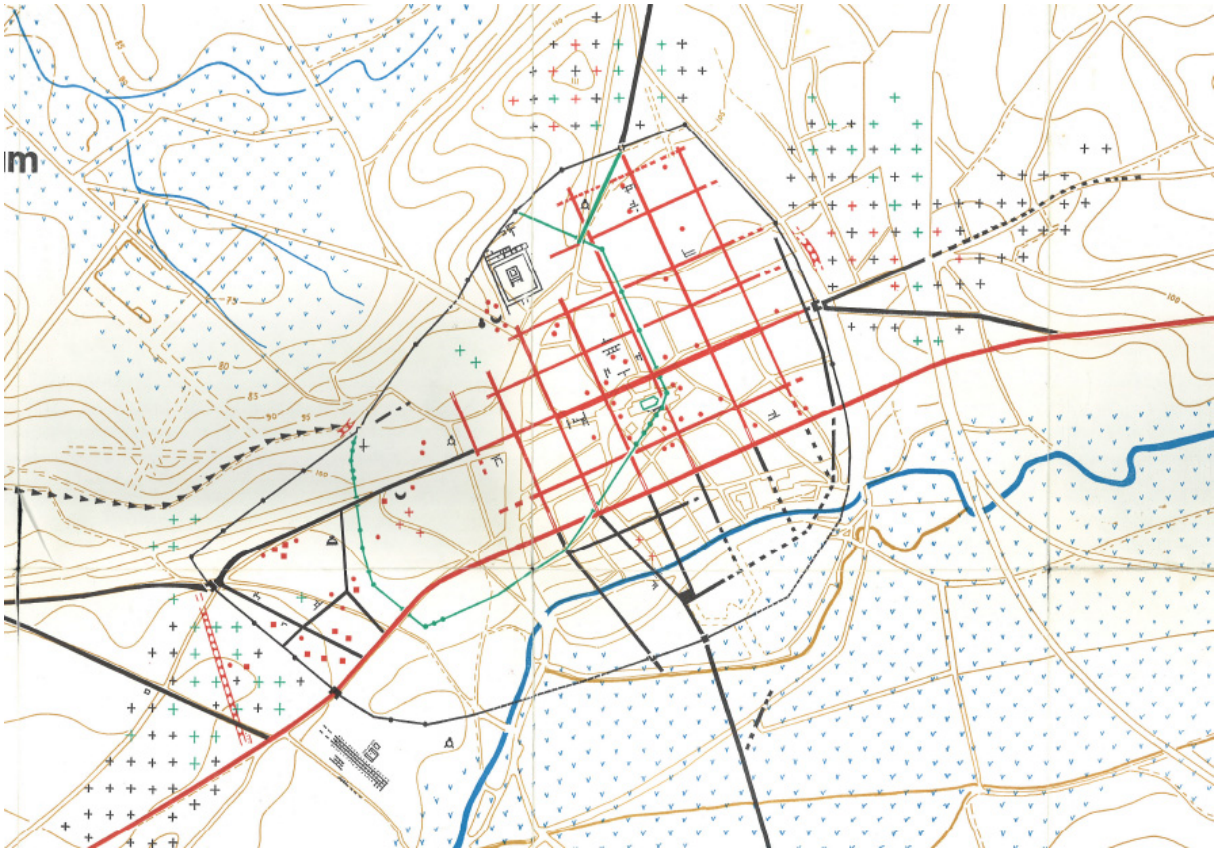


Figure 33 The Roman town of Tongeren and immediate surroundings (after Vanvinckenroye 1975).

Other known Late Roman locations inside the 4th century revealed less information. At the Sint-Truiderstraat a *hypocaustum* was encountered and was initially considered a public bath, but is more likely to have belonged to a *domus*, such as at the Vermeulenstraat. On the other side of the basilica at Maastrichterstraat, more structures were found indicating another Late Roman *domus* (Vanderhoeven in press). Additionally, we can also mention the well that was found on the terrain of the 'Kliniek', dated to the 4th century by a coin of Valentinian (Anseeuw 1987, 188). Possibly also at the Putstraat, structures related to a Late Roman private building have been found, as indicated by a samian bowl type Chenet 320 at the site, although it cannot be confirmed (Paquay 1935, 13). Finally, the dark earth covering the Late Roman phase of Tongeren was also found at the Kloosterstraat (Wesemael, Klerkx, Van De Staey 2012).

The monumental 4th century wall is believed to divide the Late Roman town of Tongeren in the permanent populated area inside the enclosure and the officially abandoned sectors outside the town wall. Although it is recognised that activities continued beyond the wall in the form of semi-permanent habitation and a source for spoliation (Vanderhoeven in press). The 4th century wall is seen as a primarily defensive

and military structure encompassing the highest and best defendable part of the town, which is approximately only half the size of the former 2nd century internal area (Vanderhoeven 2012, 138). Its construction is placed in the Constantinian period based on the masonry (Vanvinckenroye 1985, 67; Brulet 1990, 83). This monumental wall ca. 2.6 km long and 3 m wide with frequent towers positioned along its entire length and accompanied by a ca. 10 m wide ditch that gradually descended to a depth of ca. 2 m (Vanderhoeven 2012, 138; Vanderhoeven in press). Its presence has been confirmed at the following locations: Beukenbergweg, Bilzerpoort, Cesarlaan, Koninksemweg, Koppelkiststeeg, Maastrichterstraat, Muntstraat, Plein, Regulierenplein, Vrijthof and Wijngaardstraat. Additionally, towers have been encountered at the Bilzerpoort, Koppelkiststeeg (the so-called *Bishops tower*), Vrijthof and Wijngaardstraat (the so-called *Rombouts tower*) (Paquay 1935; Vanvinckenroye 1971; Smeesters 1975; Mertens 1977).

Outside the wall, some indications of the semi-permanent and spoliation activities have been found as well. At the Minderbroederstraat, three 4th century small ovens were encountered, thought to be connected to recovery of earlier Roman materials (Vanderhoeven and Vynckier 1991, 4; Vanderhoeven and Vynckier 1994, 55-56; Vanderhoeven in press). Additionally, at the Clarissastraat a sealed basement was encountered. The sealing is thought to have taken place after a fire in the 3rd century, possibly related to recovery activities (Hensen, Schurmans and Vanderhoeven 2003, 31-32). Furthermore, some Late Roman waste pits were encountered at the Sint-Truidersteenweg. One of these pits contained ceramics with glassy residue, indicating a potential craft activity at the site (Vanderhoeven, Van Rechem and Vynckier 2003, 75-76). Finally, a series of walls were found, possibly indicating the presence of a private building. It was considered Late Roman based on a Crispus coin associated with the structures (Paquay 1935, 12-13).

The most important part of Late Roman Tongeren outside the walls, is the continued use of the large cemeteries in the southwest and northeast of the town, situated along the roads. A large-scale excavation of the southwest burial delivered a good image of this cemetery (Vanvinckenroye 1984). In contrast, the parts of the northeast cemetery has been encountered in many small excavations (Vanvinckenroye 1995). Most recently, at the Darenbergstraat (Vanderhoeven and Vynckier 2003, 77) and the Jaminéstraat (Vanderhoeven, et al. 1995/1996, 85-96). These burial grounds appear to have been used by the inhabitants of Tongeren until halfway through the 5th century. A demographic estimation was made based on the contents of the graves. Vanderhoeven (in press)

describes the people of Tongeren as a "rich and heterogeneous urban population, a mix of Romanised inhabitants and Germanic immigrants, and of civil and military elements." Additionally, the presence of some Christian graves need to be mentioned as well.

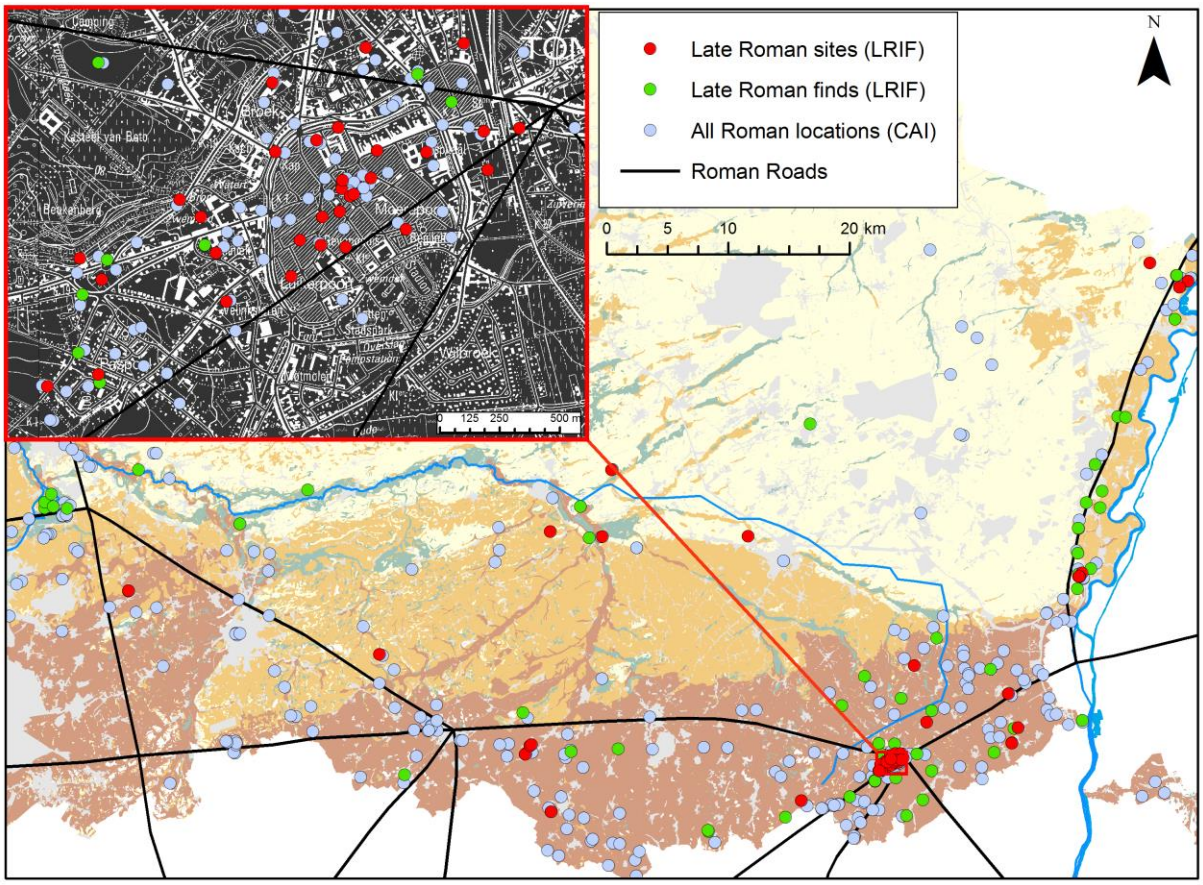


Figure 34 Late Roman situation in and around Tongeren. The Late Roman sites and finds derived from the Late Roman Inventory Flanders (Appendix 1).

Finally, a large series of 12 radiocarbon dates confirm the Late Roman construction and development of the basilica at the location of the Church of Our Ladies (Table 3Table 3 Radiocarbon dates for Tongeren that fall within the 1800-1500 BP parameters.). As mentioned above, the combined dates place the construction in the second half of the 3rd century and the first half of the 4th century. The numismatic evidence allows the initial construction to be refined to the first half of the 4th century. In addition, radiocarbon dates were acquired for a Roman burial at the location of Romeinse Kassei, in the southwest cemetery. This burial is suspected to be early Christian and is dated approximately between 260 and 380 calAD according to the ^{14}C (Table 3). Another burial *intra muros* associated with rubble from a 2nd or 3rd century building found at the Kielenstraat, can most likely be placed in the second half of the 3rd century by radiocarbon (Table 3).

Overall, we can conclude for Tongeren that the town is continuously populated throughout the entire Roman period, although the Late Roman population appears to be reduced in number. Nevertheless, some indications are given for the assuming a general prosperous situation in the 4th century, with the presence of a mixed society and tangible proof of early Christianity in our region. In order to understand the Late Roman town, we need to evaluate the surrounding country site.

Table 3 Radiocarbon dates for Tongeren that fall within the 1800-1500 BP parameters.

Location	Date	68.2%	95.4%	99.7%	Context	Sample name
Romeinse Kassei	1725 ± 25 BP	256-379	250-385	231-404	burial (early Christian)	Koninksem 2
Romeinse Kassei	1715 ± 25 BP	260-382	252-392	238-407	burial (early Christian)	Koninksem 1
Kielenstraat	1785 ± 25 BP	180-325	137-330	127-350	burial *intra muros*	Kielstraat TO 06 KI graf 2 S167
Kielenstraat	1705 ± 25 BP	264-386	255-399	243-413	burial *intra muros*	Kielstraat TO 06 KI graf 3 S153
Kielenstraat	1685 ± 25 BP	340-395	259-415	251-424	burial *intra muros*	Kielstraat TO 06 KI graf 1 S178
O.L.V.-Basiliek	1795 ± 30 BP	143-318	132-328	87-380	wooden water channel	Tongeren Basiliek TO-BA-05-102
O.L.V.-Basiliek	1760 ± 30 BP	239-330	171-383	135-388	mortar (wall)	Tongeren Basiliek TO-BA-06-133
O.L.V.-Basiliek	1760 ± 25 BP	242-326	215-380	138-385	mortar	Tongeren O.L.V.-Basilica TO-00-BA 44
O.L.V.-Basiliek	1750 ± 25 BP	248-330	232-380	142-392	mortar (floor)	Tongeren Basiliek TO-BA-05-151
O.L.V.-Basiliek	1740 ± 25 BP	253-336	240-381	174-399	mortar (floor)	Tongeren Basiliek TO-BA-05-100
O.L.V.-Basiliek	1725 ± 30 BP	256-380	245-389	213-418	mortar (wall)	Tongeren Basiliek TO-BA-06-136
O.L.V.-Basiliek	1670 ± 30 BP	345-408	258-428	246-534	mortar (floor)	Tongeren Basiliek 83
O.L.V.-Basiliek	1650 ± 30 BP	351-424	264-533	257-539	human bone	Tongeren O.L.V.-Basilica TO-95-JA 1
O.L.V.-Basiliek	1650 ± 30 BP	351-424	264-533	257-539	mortar (wall)	Tongeren Basiliek TO-BA-05-148

O.L.V.-Basiliek	1640 ± 25 BP	383-427	340-532	265-538	wall	Tongeren Onze-lieve-vrouwbasiliek 6 fraction 3
O.L.V.-Basiliek	1630 ± 30 BP	385-530	346-536	263-544	human bone	Tongeren O.L.V.-Basilica TO-01-CL 2
O.L.V.-Basiliek	1540 ± 30 BP	431-565	426-588	410-615	mortar	Tongeren O.L.V.-Basilica TO-99-BA 15

In the immediate surroundings of Tongeren multiple Late Roman finds are to be expected along the roads and in the countryside. However, the former villa-landscape had collapsed or disappeared, according to most research by Vanvinckenroye. Only for the villa 'Middelpadveld' at Vechmaal, less than 10 km southwest of Tongeren, he noted a possible continuity into the 4th century based on the finds of samian ware type Chenet 320 and Eifel ware in a well on the villa domain (Vanvinckenroye 1997, 179-192). No other buildings or traces were recorded though. Given the densely occupied earlier Roman landscape, we have to wonder if this is also not merely the result of applying an uncritical historical view on the archaeological record, combined with a fixation on the main villa building, rather than investigating the villa-complex in its entirety and their transformation in the 3rd to 5th century (Esmonde-Cleary 2013, 299-302).

On a similar distance to the northeast, a single V-shaped ditch was found at Vlijtingen – Lafelt (Riemst), along the road to Maastricht. Based on its defensive character, a Late Roman date was proposed (Vanderhoeven, Vynckier and Pauwels 1999). No directly associated finds can corroborate this, but other finds from the immediate area suggest the potential for Late Roman activities. The most recent find was a lead sarcophagus that was encountered in a field near the Toekomststraat in Riemst. A radiocarbon date of ca. 240-330 calAD (1760±25BP) and a Constantine coin in the burial fill put the grave in the Late Roman period (Vynckier and Vanderhoeven 2010). No grave goods were present to specify further on the social or chronological context. The burial rite in a sarcophagus is considered to be traditionally Roman. Another three burials are known from the site of Val-Meer or Bolderstraat, not far from where the sarcophagus was found. Of these three burials, one was a cremation, one an inhumation and the third could not be determined. Grave goods consisted of Eifel ware, glass vessels, a belt buckle and a coin. Additionally, Constantinian coins were reported in the immediate vicinity (Vanderhoeven, Vynckier and Pauwels 1999; Pauwels, Vanderhoeven and Vynckier 2002, 311-312).

Between these graves and Tongeren lies another similar burial that has been discovered in 1877 at ‘s Herenelderen. This cremation contained also a glass vessel, in addition to two brooches and a Constantinian coin, placing it in the first half of the 4th century (Van Doorselaer 1964a, 144).

Also in close proximity to Tongeren, six inhumations were found at Hoeselt. These burials contained no grave goods, leading the archaeologists to assume a Late Roman or Early Medieval date (Smeets 2012, 19-23). A final potential burial was reported in Kortessem within the 10 km radius from Tongeren. The finds contained samian and Eifel ware, proposing a Late Roman date (Croes 2002). Other Late Roman finds from within the 10 km radius consist of a Constantine coin from Vreren (Bauwens-Lesenne 1968, 371), a Valens coin and a Late Roman terra nigra foot-vessel type Chenet 342 from Piringen (Nales and Bink 2005, 28, 35) and the well-known coin hoard from Koninksem with ca. 350 coins containing 4th century examples from Constantine to Arcadius/Honorius (Lallemand 1965a, 89-107; Roosens 1966, 41).

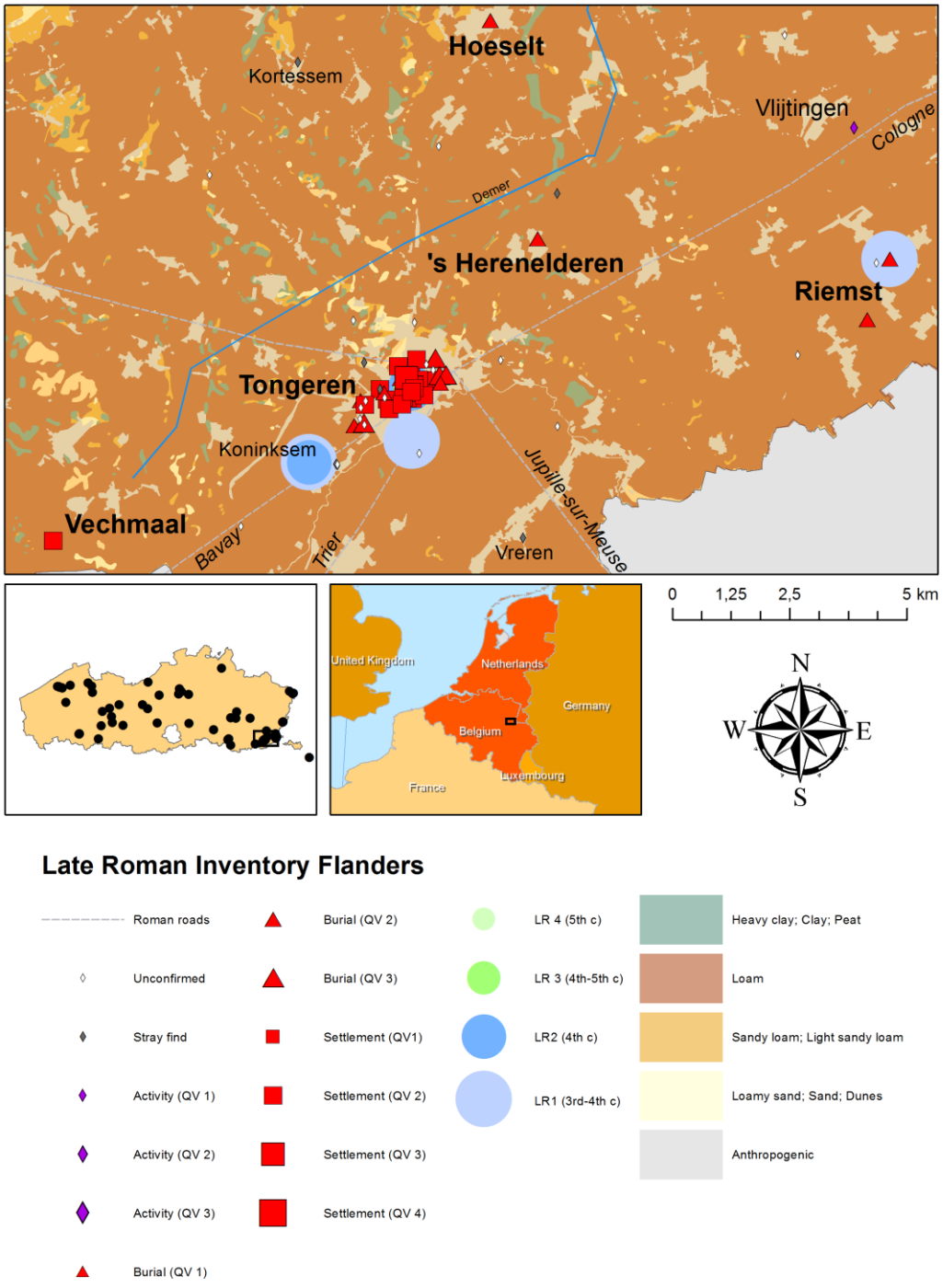


Figure 35 Tongeren and the surrounding area: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.5.2 The wider local network around Tongeren

When a wider radius of ca. 30 km is drawn around Tongeren, a number of Late Roman sites can be listed. First, on the loamy soils west of Tongeren along the road to Tienen-Kerkhove-Kortrijk, the area around Tienen reveals some Late Roman activity. On the former villa-domain of Wange, a Germanic occupation from the 5th and 6th century were found, consisting of eight sunken hut features and a cemetery on the same location as the 2nd and 3rd century Roman burial ground (Figure 36). This settlement has been interpreted as a Frankish settlement and one woman's grave could be dated to ca. AD 440 based on her grave goods (for an overview see: Opsteyn and Lodewijckx 2001, 217-230; Opsteyn and Lodewijckx 2004, 125-155; for more and earlier publications see Appendix 1). Additionally, two V-shaped ditch were discovered running along the road Tongeren-Tienen and were assigned a late 3rd century date, given its defensive properties (Lodewijckx 1996, 214-216). A short distance south from here, at the St. Gertrudis church, a Merovingian settlement revealed two burials without grave goods that were considered early 5th century Frankish graves (Piton 1981, 36; Provoost 1981, 32).

Related to these finds, although somewhat beyond the 30 km radius, along the road from Tienen to Elewijt a potential sunken hut feature was found at Kerkom. The structure was filled with tiles and burned clay and based on a further lack of finds, it was placed in the 4th to 5th century (In't Ven and De Clercq 2005, 148-149; In't Ven et al 2005, 283-300).

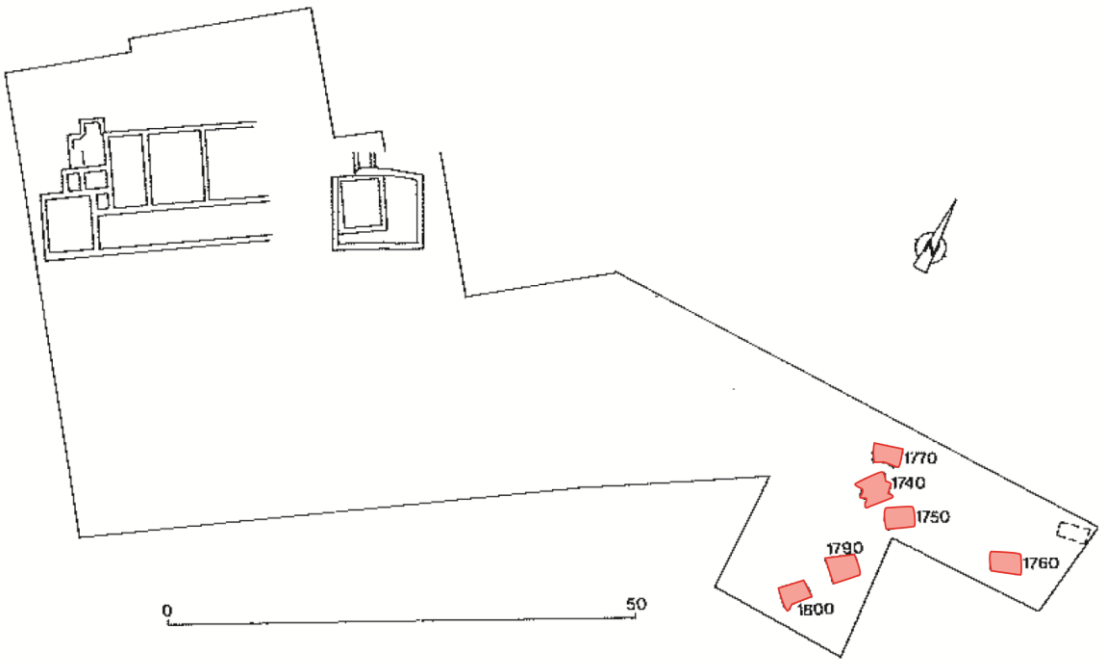


Figure 36 Site plan of Wange with the Roman villa (left) and the sunken hut features (right) (after Opsteyn and Lodewijckx 2004, 127, fig. 2).

To the north of this area and approximately 30 km to the northwest of Tongeren, a small cluster of Late Roman settlements and finds can be found along the Demer. Of these, Donk is a well-studied and much-referenced 4th century rural site (the most complete overview can be found in Van Impe 1983). Germanic people arrived on the location of an earlier Roman settlement, which either had only been abandoned for a short time or continued on into the 4th century alongside these new settlers. This conclusion derived from the fact that the new buildings, houses and sunken huts, had taken the existing 3rd century buildings into account and were constructed according to a similar orientation (Van Impe 1983). Their Germanic origin is widely supported by the material culture, of which direct ties to areas north of the Rhine have been demonstrated by means of ceramic petrography (De Paepe and Van Impe 1991; and see Chapter 6). The continued or short hiatus in occupation is supported by a series of four Late Roman radiocarbon dates ranging sequentially from the 3rd to the 5th century: 140-330 calAD (1780±60BP), 240-380 calAD (1740±50BP), 180-400 calAD (1740±80BP) and 430-560 calAD (1550±50BP). More radiocarbon dates from Donk were combined to review the large chronology of the site by Van Strydonck (1992). For the Roman period, the combination model revealed two peaks: one in the 3rd century and one in the 4th century. In the continuity from the Bronze Age to the Middle Ages, an occupation hiatus appears for the 5th to 6th century, suggesting an abandonment of the Germanic settlement in the early 5th century (Van Strydonk 1992, 46-51).

Figure 37 Donk: the Roman-Germanic settlement of the 3rd and 4th century: the 2nd and 3rd century structures are unedited; structures dated to the Late Roman period are marked in red; sunken huts (*Grübenhausen*) are marked in green; undated Roman features are marked in blue (after Van Impe 1983, 78-79, fig. 7).

Immediately to the west of Donk, some additional radiocarbon dates from an unidentified layer containing handmade pottery at Halen also support a 3rd century continuity by dates of 140-250 calAD (1800±30BP) and 230-330 calAD (1770±30BP) (Cornelis and Sevenants 2011, 24). Additionally, we can mention the stray find of a Crispus coin close to Donk (Bauwens-Lesenne 1968, 103).

On the other side of the Demer, to the north of Donk, a recent excavation uncovered a rural settlement at Meldert (Figure 39). A number of houses (ca. 6), sunken hut features and secondary structures have been found, suggesting agricultural and husbandry activities. Noteworthy is the absence of a direct known Roman predecessor at this location. The houses plans and sunken huts indicate a likely Germanic population and the

material culture places it in the general 4th and 5th century. A selection of Late Roman foot-vessels (see Chapter 7) and handmade pottery has been integrated into the petrographic analyses in this study (see Chapter 6), which showed connections to the Eifel region and possible the river area in the Netherlands. No concrete proof for a provenance of northern parts of Germany or the Netherlands have been encountered in the handmade pottery. A radiocarbon date places the main activities in the 5th century with a 430-540 calAD (1569±45BP) and is supported by a dendrochronological *post quem* date of AD 411-412 (Smeets and Steenhoudt 2012).

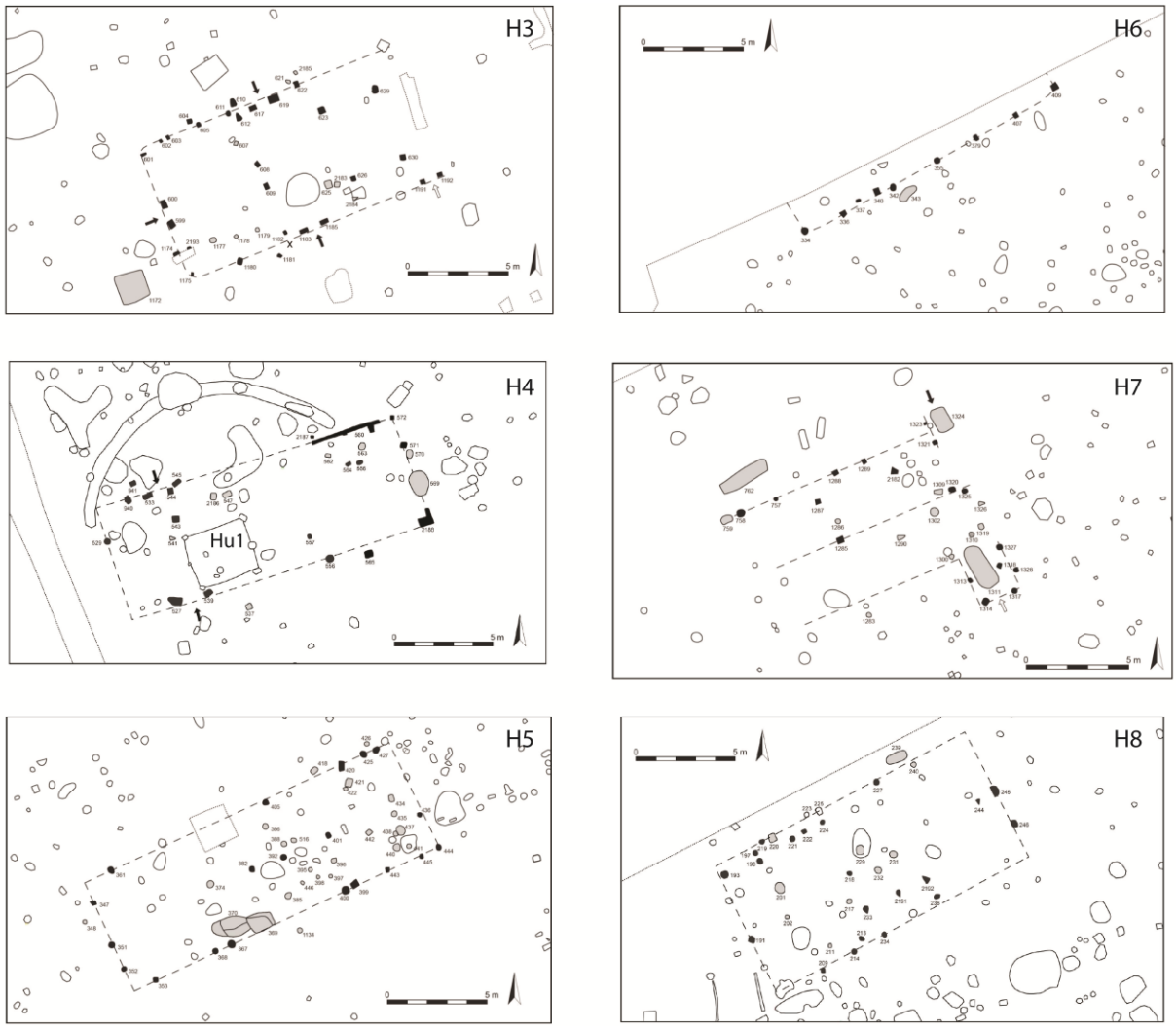


Figure 38 Lummen – Meldert: Late Roman houseplans H3-H4-H5-H6-H7-H8 and sunkenhut feature Hu1 (Smeets, Steenhoudt 2012).

More recently, another Late Roman rural settlement has been excavated to the west of these two sites. The site of Hasselt (Figure 39) is situated along the Demer towards Tongeren and revealed a number of houses that show a good resemblance to the Wijster house types, north of the Rhine (Van Es 1967). This supports a Germanic population for

this site as well, although no sunken hut features have been encountered. Also from this site, a selection of handmade pottery was taken and revealed a connection to the Eifel region. Additionally, a single sherd was confirmed with a provenance from the area of northern Germany and the Netherlands (see Chapter 6). In general, the site was dated to the second part of the 4th century and throughout the 5th century (Hazen 2014).

In close vicinity to the site of Hasselt, a radiocarbon date on a human skull from the Herkenrode abbey was dated to 335-410 calAD (1675±35BP), supporting an active 4th century population in the direct area. Additionally, we can also mention the coin hoard from Houthalen-Helchteren, some distance north of this cluster, containing coins ranging from Gratianus to Honorius (Lallemand 1961, 47-69), suggesting a 4th to 5th century continuity of Late Roman activity in this general area.

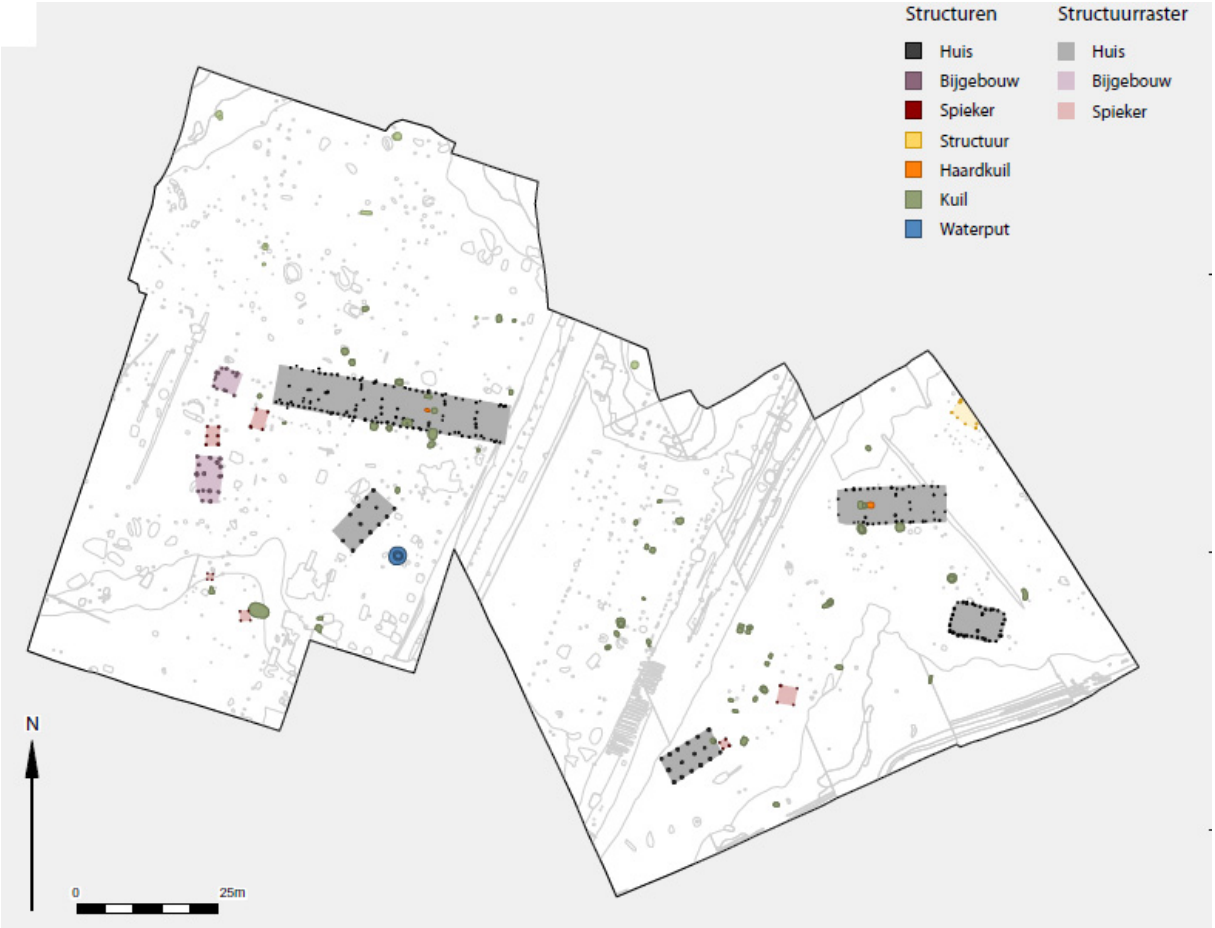


Figure 39 Site of Hasselt – Rode Rokstraat: Late Roman dwellings and secondary buildings (Hazen 2014, 104, fig. 1).

The final settlement within a ca. 30 km radius from Tongeren on Flemish soil is Neerharen-Rekem, which is situated on the sandy loam soils along the Meuse and the road between Maastricht and Nijmegen. Similar to Donk, this has been a widely

referenced site for the Late Roman period in our region. Near the 3rd century villa, many sunken hut features were found as well as some (partial) house plans that demonstrated similarities with construction techniques from across the Rhine (for the most general overview, see De Boe 1983; 1987) (Figure 40). The evidence from this site is rich and plenty, both foot-vessels and handmade pottery have been selected for further petrographic analysis (see Chapters 6 and 7). The handmade pottery also revealed probable connections with the Eifel and general Rhine area in the Netherlands. No direct provenance from north of the Rhine could be established. Furthermore, a more recent thorough study of the numismatic evidence delivered some new insights and consideration into the nature and chronology of the site. These new results from the large collection of 4th century coins place the start of the reoccupation between AD 360-400 and imply a continuity for the first half of the 5th century, after which the site is abandoned until the 7th century. The general evidence is interpreted as a rural community. In any case, evidence is present for agricultural activities and small scale craft production. The presence of numerous coins is thought to be linked either to the presence of Germanic soldiers/mercenaries or the exchange of surplus and craft products for coins in the regional economic network of Tongeren and Maastricht (Stroobants 2013).

At the site of St. Petronella, only a small distance south of the Germanic settlement at Neerharen-Rekem, a square structure was excavated which is considered to be a Gallo-Roman temple or an early Christian church. Adjacent to this, a small Roman cemetery was found containing mostly 2nd and 3rd century burials, although also a single 4th century burial was encountered (Claassen and Janssen 1972; Janssen 1982, 125-127, 137). Furthermore, the direct area has delivered multiple stray finds of 4th century samian ware, Eifel ware, as well as an Arcadian coin, a Wijster hairpin and a military belt buckle (Thirion 1967, 76; Heeren 1976, 41; Wesemael 2008, 15).

Figure 40 The site of Neerharen-Rekem. The Late Roman features are marked in green: 1-3: houses; unnumbered: sunken hut features. The features of the earlier Roman villa domain are marked in red: A: main villa building; B: baths; C: basement; D: stable; E: barn; G-H: secondary buildings; I: fence (Stroobants 2013, 73, fig. 2).

Further along the Meuse and the road to Nijmegen, another small Late Roman cluster can be found at ca. 50 km distance of Tongeren on the location of Kinrooi. On the old riverbed of the Meuse, a docking quay was found and dated by radiocarbon to 230-325 calAD (1775±25BP) (Heymans 1978, 24; Keijers 2000, 191). Additionally, a burial site containing mostly 2nd and 3rd century graves provided at least one 4th century burial, based on the finds of a Late Roman terra nigra foot-vessel type Chenet 342 or Gellep 273/274 and some Late Roman glass vessels (Keijers 2000, 93-113, 186-194). Furthermore, along the road to Nijmegen, another small burial site was found which has been thought to have had a short 4th-5th century use, based on the finds of samian bowls of type Chenet 320 (Keijers 2000, 128-142). Some distance to the west, other elements with a similar date as the finds from Kinrooi can be mentioned here. The first is a well at St. Huibrechts-Lille that has been dated to 225-330 calAD (1770±35BP) by radiocarbon. Additionally, coin finds

from Postumus and Constantine, as well as samian ware with roulette decoration have been reported at Achel (Bauwens-Lesenne 1968, 3).

The combination of these finds suggest a 3rd to 4th century continuity of habitation along the Meuse between Tongeren-Maastricht and Nijmegen. Many more stray finds were found along this section of the Meuse and the road, however, most could not be confirmed in this study. Nevertheless, the frequent reporting of Late Roman finds support the notion of a Late Roman population along this river-road axis between Tongeren and Nijmegen.

To derive a single explanatory conclusion for Tongeren and the immediate and medium-distance surroundings from this evidence is undesirable given the wide variety of the archaeological record. Nevertheless, a general summary is necessary to place the former *civitas* capitol and its local network in its proper context in order to build a comprehensible framework for the study of the material culture. Based on the finds presented above, Tongeren has known a continued urban society that carried on into the Late Roman period. Multiple signs of wealth and a 'Romanised' way of life are present, suggesting that a local elite or provincial aristocracy still remained within its walls. Despite this, the agricultural system of the villa-culture on which the power for this social class was based seemed to have disappeared almost completely. This is not a local phenomenon, but is a visible trend for Northern Gaul in its entirety. Recently, the explanation of destruction by barbaric incursions has been revoked and replaced with a model of *long durée* that sees the 2nd century as the largest expansion of the villa-system in Northern Gaul as the result of a 'consumer revolution' deriving from economical and political wealth and cultural change (Esmonde Cleary 2013, 300 after Woolf 2000). This economical and cultural peak started to weaken already in the early 3rd century. This transition was already well underway before the major '3rd century crisis', which rather expedited the transformation of the system for agricultural exploitation, rather than be the sole cause. Nevertheless, the newly erected wall and basilica demonstrate that a wealthy class was still present or was connected to state financing. The presence of early Christianity is also a sign that the inhabitants of Tongeren remained very urbanised and connected to the major changes in the wider Roman Empire.

The immediate surroundings of Tongeren has provided us with multiple signs that a 3rd to 4th century continuity was present, albeit in varying degrees. We know that the main villa buildings were no longer occupied, but the stress on the main residential building left us with the possibility that the larger agricultural base for Tongeren still survived on

a smaller scale. The many burials outside the urban centre, such as in Riemst and Kinrooi, show us that these areas were still populated in the 4th century. A similar pattern as for the west seems to hold: a reduction of sites clustering near the rivers and roads. In this case the Meuse and the roads to Maastricht and Nijmegen. The same holds true for the reoccupied sites such as Donk and Hasselt, which are both located along the Demer. These settlements have a clear Germanic character, be it completely or partially merged with an existing Gallo-Roman society. To this list we can add Neerharen-Rekem and Wange, all in a ca. 30 km radius of Tongeren, which is an acceptible distance for an agricultural supportive network. All signs point towards a rural society involved in agriculture and husbandry, suggesting that a new and more direct economic system arose in the disappearance of the villa-based system. The suggestion of Germanic soldiers or weapons-for-hire has been considered for Neerharen-Rekem, although not much evidence in these Germanic settlements support this notion. Additionally, these new settlements are considered to have been inhabited for multiple generations with a gradual abandonment phase throughout the 5th century. Furthermore, a military settlement in the country side appears unlikely in the close vicinity of known military forts on the Meuse such as Maastricht and the 'regular' military units present in Tongeren (see above).

Moreover, a connection has often been made with the placement of 'Salian Franks' by *caesar* Julian, or their illegal presence before their encounter in Tongeren ca. AD 358. As told by Ammianus Marcelinus, these were rather 'peasants' than soldiers (AM XVI.11 and 1.1 On Late Roman Gaul). Whether or not these people called themselves Franks or were called as such, the emergence of Germanic dwellings in the 2nd half of the 4th century within a small radius around Tongeren, suggests an organised act rather than a random wandering of people. This is also supported by the frequent repopulation of former villa areas, such as at Wange and Neerharen-Rekem. Possibly the state aristocracy based in Tongeren tried to revive the former agrarian surplus system.

Finally, it has to be stated that the evidence delivered here only represents the sites and finds located in Flanders. Tongeren is located at the very southeast of Flanders and thus only a part of the larger image has become clear. It is very likely that to the south and east the ca. 30 km radius holds much more agricultural revival by Germanic settlers. For instance, the recently excavated site of Baelen in Wallonia ca. 30 km to the southeast of Tongeren forms a good comparison. The 4th century reoccupation near the former Roman settlement indicated the presence of a Germanic rural dwelling of which the finds match that found on sites such as Donk and Neerharen Rekem (Hanut, Goffioul, Goemaere

2012; Hanut et al 2013). Also possibly Voerendaal in the Netherlands, ca. 30 km east of Tongeren (Willems 1986; Willems 1988). In all, this demonstrates a very active Late Roman society with urbanised elites and early Christians, rural settlements with a varying degree of Gallo-Roman and Germanic inhabitants, as well as an evident military factor due the close proximity to the Rhine frontier. The scale, impact and interactions of these different social and cultural factors will be considered more detailed and put in a wider framework after the study of the material culture (see Chapter 9).

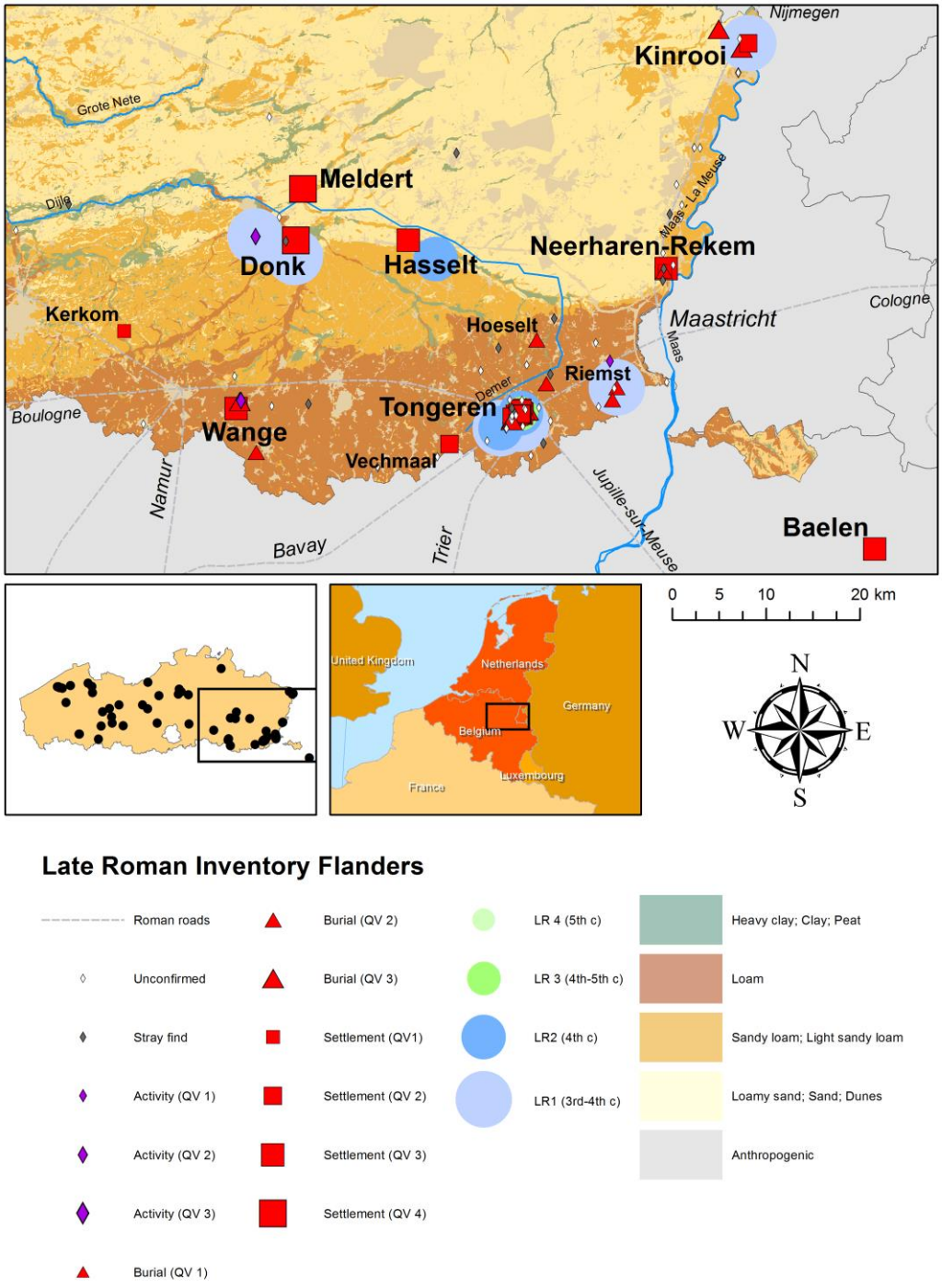


Figure 41 Germania Secunda (within Flanders): locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.6 Southwest Flanders: Heuvelland and the Yser basin

After considering the clusters of direct and indirect evidence for Late Roman population and activity in the area of Flanders, there are two noticeable gaps in the landscape. The first is situated in the northeast of Flanders in the general area between the Scheldt and the Meuse and north of the tributary rivers, adjacent to the southern Netherlands. The second is located in the southwest, between the North Sea and the river Lys, adjacent to northern France. For both these areas, it can be argued that these 'gaps' are due to a lack of research in comparison to the other areas and, additionally, can be tied to preservation issues regarding the sandy soils. Both are undoubtedly true, but until further evidence states the contrary, we have to assume that these areas were not widely incorporated in the active Late Roman landscape. For now, we will review the scarce evidence that is present for these regions.

The area of southwest Flanders has only revealed some sporadic Late Roman or Early Medieval stray finds such as some 'Anglosaxon' pottery dated to the 5th or 6th century and a glass vessel with dolphin-shaped handles, which is generally placed in the Late Roman period, were found at De Panne (Roumegoux and Termote 1993, 78; Vanhoutte 2011, 5, 9) More frequent though are finds from the second half of the 3rd century: the coin hoard from Izenberge, containing coins from Gordianus III to Postumus (Thirion 1967, 99; Roumegoux and Termore 1993, 77); the Galienus coin hoard from Noorschote (Thirion 1967, 131-132; Roumegoux and Termote 1993, 76-77); the coin hoard of ca. 700 coins ranging from Vespasian to Postumus at Elverdinge (Thirion 1967, 75; Roumegoux and Termote 1993, 77); the coin finds from Maximian or Galienus in Poperinge (Bauwens-Lesenne 1963, 99; Roumegoux and Termote 1993, 76-77); the Wijtschate coin hoard with coins ranging from Trajan to Postumus (Thirion 1967, 175-176; Roumegoux and Termote 1993, 77); and an assemblage of pottery associated with a Postumus coin from Dranouter (Thirion 1967, 71; Roumegoux and Termote 1993, 77). In addition, a Constantine coin was found at Ieper (Bauwens-Lesenne 1963, 46-47), as is more common for finds closer to Kortrijk, such as at Izegem (Devliegher 1962, 17) or Wervik (Brulet 1990, 117; Termote 1995, 8). These finds present an interpretative challenge. No settlements, structures or contexts are present, yet multiple coin hoards and stray finds occur all over and not along the Yser or the roads. This suggest that people moved and/or lived (semi-)permanent in the landscape. A first possible interpretation is the presence of specific crafts, for instance the gaining of natural resources such as peat, wood or salt. A second suggestion is the

possibility of a more pastoral society in the coastal hinterland, with less fixed settlements that left less traces that are visible in the archaeological record. Both are pure speculation at this point, but open up a new avenue of thinking for the change in population for the coastal hinterland, rather than a complete abandonment.

Furthermore, there is one set of structures that has been dated to the Late Roman period for this empty area. Underneath the St. Peter in Chains church at Torhout a stone double squared-foundation was found (Figure 42). Its significance has been debated first as a Carolingian church, followed by the interpretation of a watchtower (Cools 1986, 81-90; 1988, 84-86), which has been put into question more recently and is thought to have been a Roman temple (Huyghe 2010, 128-140; Decraemer, et al. 2011, 57-62). A similar structure has been found underneath the foundations of the St. Salvator church at Harelbeke (a former Roman *vicus*), which is interpreted as the oldest church (Devroe and Gierts 2014, 11). Although the structures' chronology cannot be confirmed or denied at this point, the church grounds revealed more Roman traces that were confirmed by a more recent excavation (Huyghe 2010, 9-18). Despite its stratigraphic and numismatic evidence and its location near the Zeeweg, no other Late Roman finds or structures have been found in the vicinity. If the assigned chronology is correct, it might be seen as a possible central point in the landscape for a less permanently settled pastoral society, or maybe it can be considered to be sanctuary in context with the military presence and traffic in the general area.

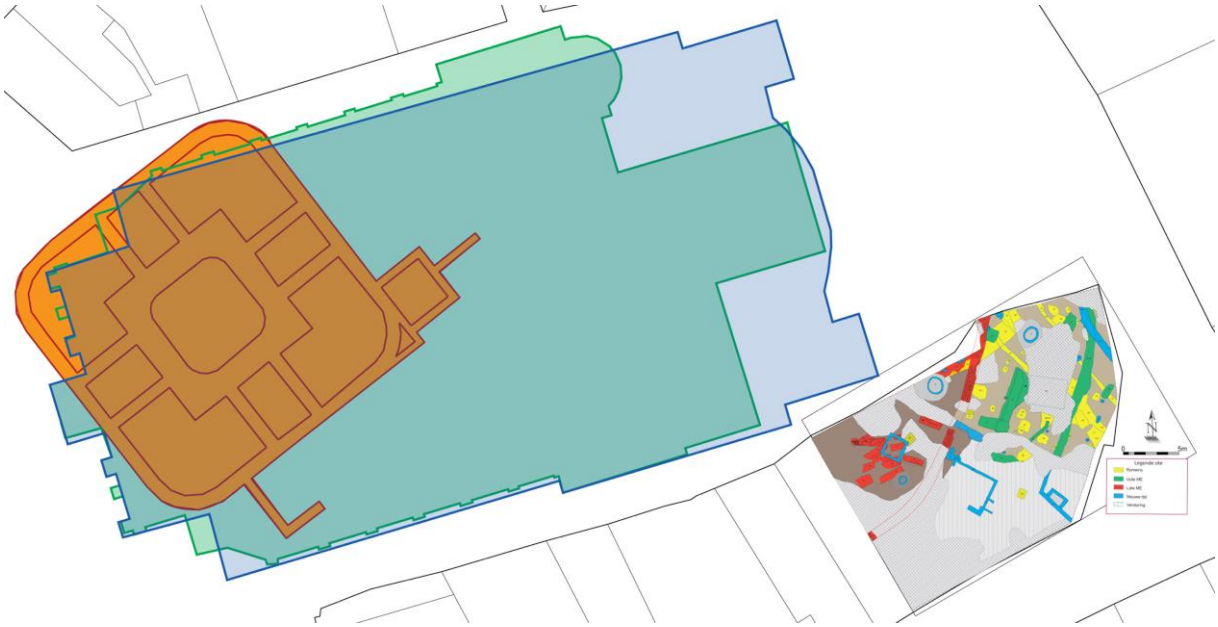


Figure 42 Late Roman structure and traces at Torhout: the double-squared structure (left); and the Roman traces from the recent excavations (right) (provided by J. Huyghe from RAAKVLAK).

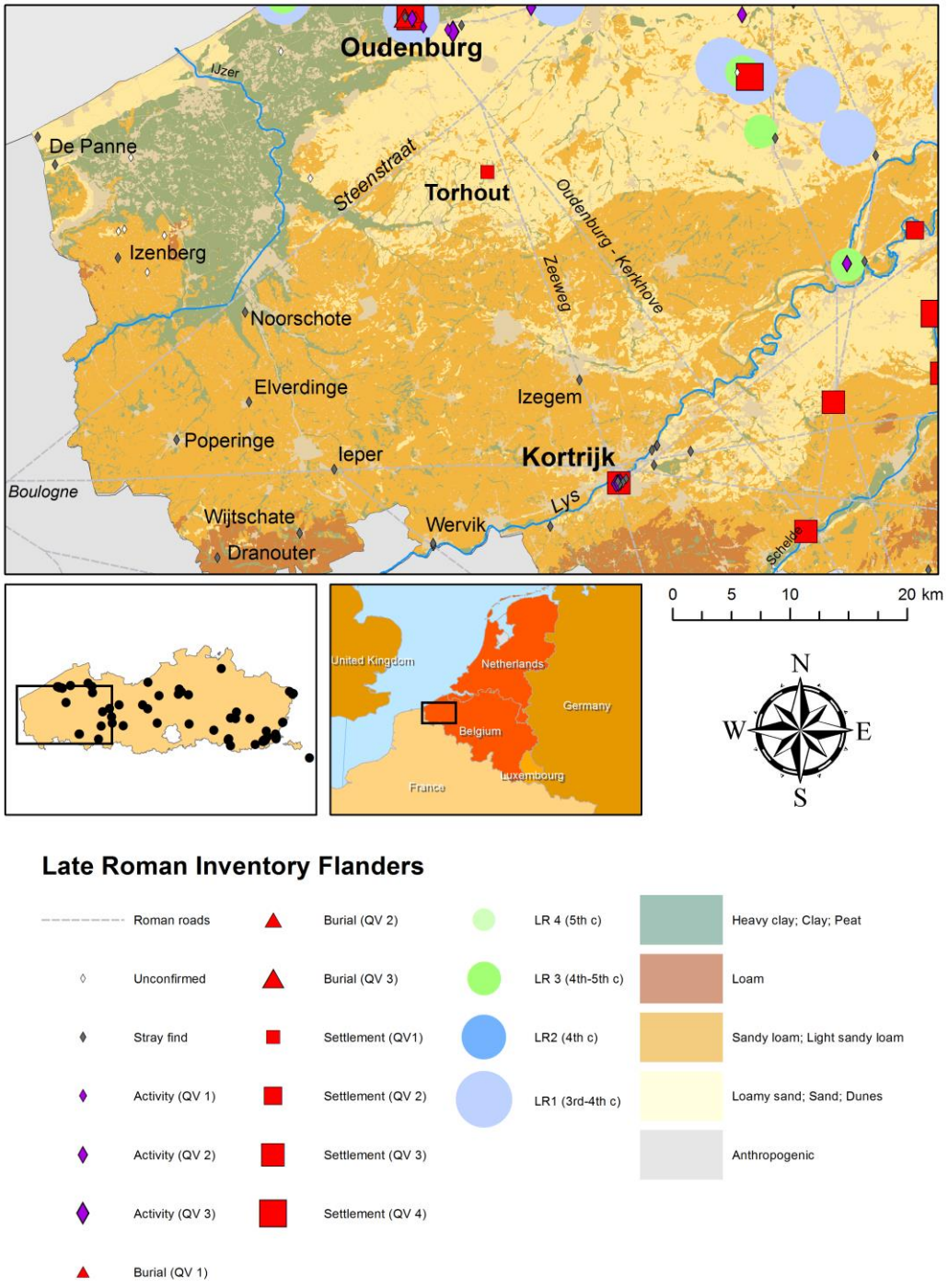


Figure 43 Southwest area of Flanders: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.3.7 The Flemish Campine area

The second area in the northeast of Flanders has not yielded a distribution of stray finds that could indicate some sort of activity. Only one Roman settlement has been found to show a continued population into the 4th century at Turnhout – Tijl-en-Nelestraat (Figure 44). The excavation revealed two houses (7 and 8) that can be placed in the late 3rd to early 4th century by radiocarbon dating. House 7 was dated 250-333 calAD (1745±30BP) and house 8 was placed between 248-330 calAD (1750±25BP). Among the finds in these dwellings, was a large portion of handmade pottery, which has been selected for further petrographic study (see Chapter 6), and Eifel ware (De Smaele, et al. 2012).

Close to this site, another radiocarbon date pointed to a late 3rd population, which was provided by the site of Oud-Turnhout-Bentel and resulted in 240-330 calAD (1760±30BP). Another radiocarbon result from this site falls within the 1800-1500 BP parameters with a date of 430-560 calAD (1545±30BP), but is more likely to belong to the initial phase of the early Medieval settlement. Furthermore, one additional radiocarbon result was found matching a possible late 3rd – early 4th century indication from Brecht – Zoegweg for a 253-336 calAD (1740±25BP).

Overall, the northeast of Flanders does not appear to have been populated beyond a possible final phase in the late 3rd and early 4th century from existing Roman rural settlements. The Dutch counterpart also reveals little information, but this will be reviewed in Chapter 9. Until more evidence of settlements or activities is found, we have to assume that this part of Late Roman Flanders was abandoned.

Figure 44 Turnhout Tijl-en-Nelestraat: Roman settlement with two late 3rd century houses Str 7 and 8 (after De Smaele 2012, 30, fig. 5.9).

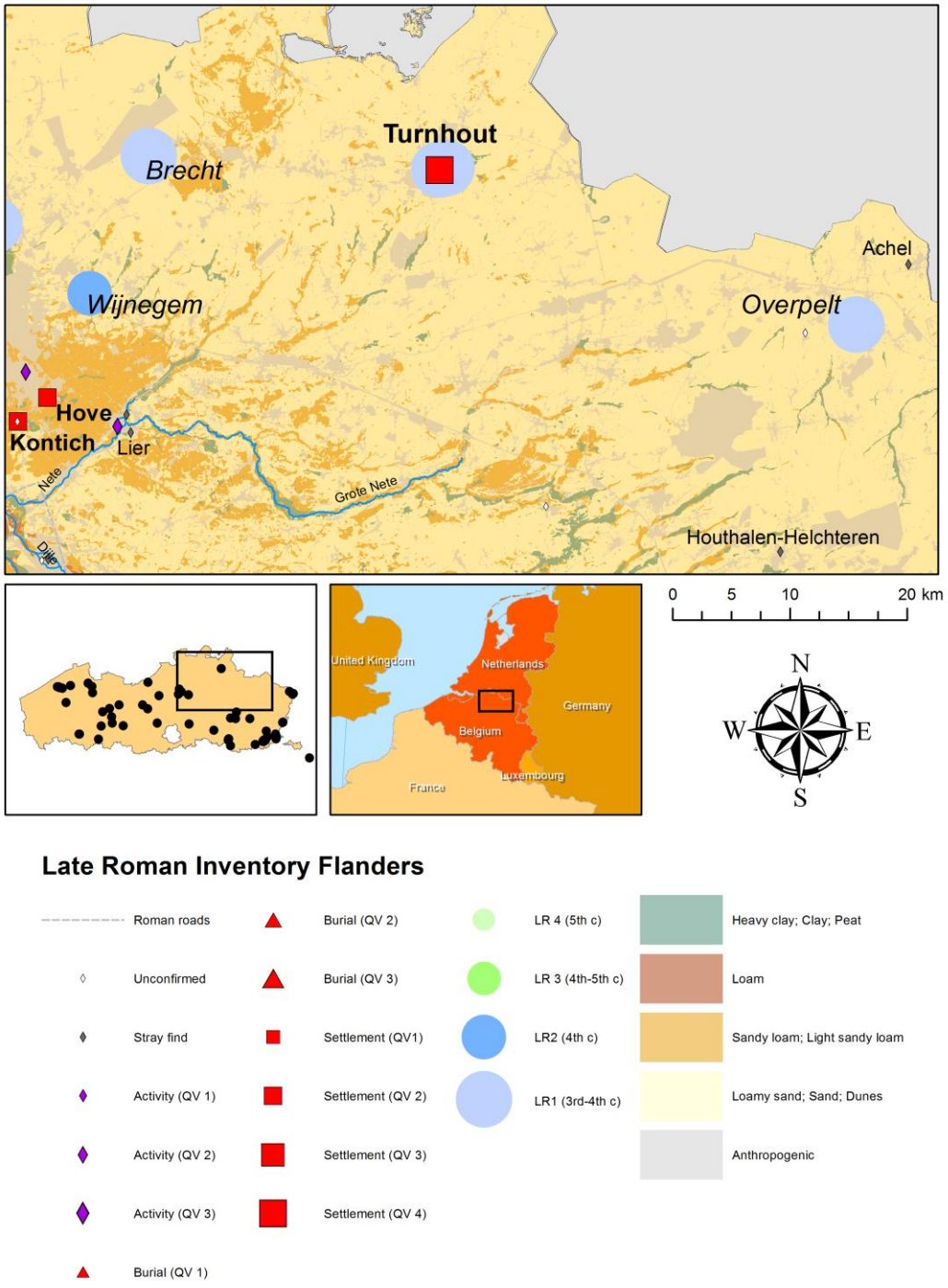


Figure 45 Northeast area of Flanders: locations of Late Roman sites and radiocarbon dates. Late Roman Inventory Flanders icons reflect Type Value and Quality Value. Late Roman ^{14}C is divided into 4 overlapping chronological phases between 260 and 475 calAD. Roman roads are after G. Verbrugghe 2016 and combined with the DARMC roman roads version 2008.

4.4 The Late Roman archaeological record in Flanders

The review of Late Roman occupation in Flanders has revealed a number of issues in the archaeological approach towards the Late Roman period. It is still believed that the entire region between the Rhine and the road Bavay-Cologne is an empty area, depopulated as the result of barbaric incursions. The fragmented state of research, focussing on local sites or micro-regions, has not improved this general idea, dominated by uncritical copying of historical narratives. The overview delivered here, the Flanders case study, - a mainly rural hinterland south of the Lower Rhine region - proves that new considerations are necessary. Arguably, the evidence is pointing to a largely empty and discontinued landscape in the 4th and the 5th century AD. The aim is not to deny a population regression or a down-scaling economy in comparison to the earlier Roman period, but to argue that the lack of Late Roman finds in the Flemish archaeological record is biased by recognisability on the one hand, and the persistence of an incorrect application of paradigms on the other hand.

4.4.1 Recognisability

Here, the issue of recognisability is addressed. Following the extensive review of the literature, multiple databases and excavation reports, it became evident that a Late Roman chronology is only defined based on a limited amount of parameters.

4.4.1.1 Late Roman identifiers

The lacking recognisability of the Late Roman period in archaeological record is primarily caused by the limited variety in material culture, as it is often difficult to identify and not so precise to date, compared to the earlier Roman material. This is particularly the case for handmade pottery. When reviewing all Late Roman sites, it became evident that a small range of recurrent reasons were given for dating a site or structure in the Late Roman period. For the ca. 40 sites that can be considered as different Late Roman sites the following primary Late Roman identifiers were given: Wijster houses, sunken hut features, inhumations, stratigraphic evidence, Late Roman pottery assemblages, Argonne samian ware, Eifel ware, Late Roman terra nigra foot-vessels (usually Chenet 342), coins, Germanic handmade pottery, radiocarbon dates, (Germanic) brooches and glass vessels.

Occasionally other finds were mentioned, but these were usually found in sunken hut features or in association with one or more of the aforementioned items. When exploring the number of times these features and finds were used to identify a site or structure as Late Roman, some trends become obvious.

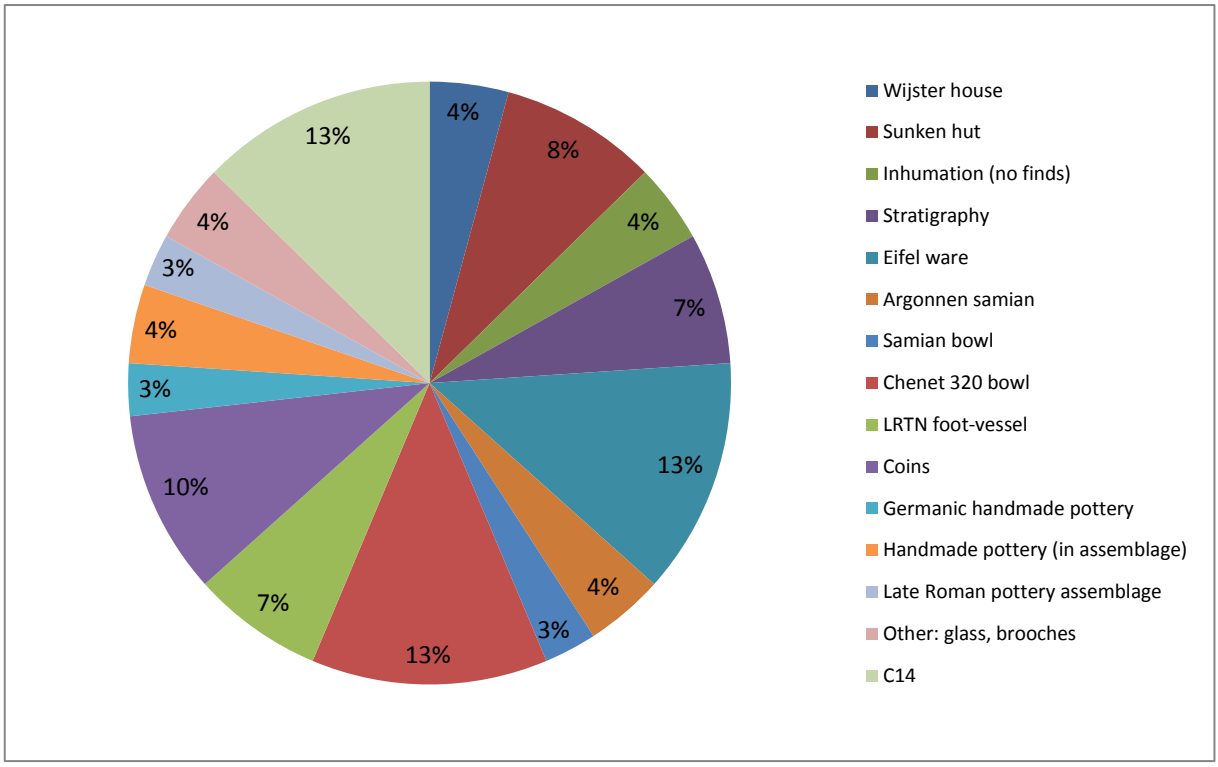


Figure 46 Primary Late Roman identifiers from 40 different sites in Flanders as mentioned in the literature and reports (n = 71).

Chart (Figure 46) shows that Eifel ware, samian bowl type Chenet 320 with roulette decoration and radiocarbon dates are the most recurring reasons to date a site or structure in the Late Roman period, i.e. the general 4th century. Closely following these elements are coins, sunken hut features, stratigraphy and terra nigra foot-vessels type Chenet 342. Thus, there are only a very limited number of parameters to identify the Late Roman period. For instance, the evaluated landscape mainly consists of rural settlements, where the major category of recovered material culture is handmade pottery. Despite their large proportion within the Late Roman ceramics spectrum, handmade pottery was mentioned as decisive factor for a Late Roman chronology in only ca. 7% of the cases, and more specifically when the handmade pottery had a clear 'exotic', i.e. Germanic, character or when it was found in assembly with other 4th or 5th century dated material.

As the Argonne ware, the type Chenet 320 and the 'samian bowl' together are good for 20% of the Late Roman identifiers, it is clear that samian ware remains the preferred

identifier for a Late Roman presence. Indeed, the roulette decoration is well documented and can provide accurate dates. Nevertheless, in literature and reports these are often not more precisely dated than the general 4th century. Because the broad chronology of the general Eifel products and imports, also the Eifel ware is slightly problematic as an identifier for the Late Roman period as the dating potential of Eifel ware is not used to its fullest in Late Roman archaeology in Flanders. Coins are often used to date structures and occupation phases of sites, but here too some cautiousness is needed as conclusive economic models for Late Roman Northern Gaul are still mainly lacking. Stroobants (2013) however, provided, with the revision of Neerharen-Rekem, a good example of how numismatic analysis can lead to new insights when taking changes in economic context into account.

A possible explanation for the decrease in variability in material culture lies in the mainly rural character of the society of Late Roman Northern Gaul. In a rural community, numerous commodities had an important role in the everyday life, but remained nevertheless invisible in the archaeological record (Gerrard 2013). For instance, exchange or trade of produce and livestock, as well as products in more perishable materials such as textile or objects made from organic materials, will have occurred regularly between communities. It is possible that the set-back of the 3rd century transformed the economic landscape in a way that other, more basic products gained importance in the local economy. Unfortunately, this translates into a society less tangible and visible in the archaeological record.

Besides material culture, the most recognisable Late Roman features are the sunken huts (see Figures 25 and 38), next to the recently excavated, increasing recognisable, Wijster-houses (Figure 48). Noteworthy is the absence of Late Roman, local or Gallo-Roman houses in the literature. It can be argued that Gallo-Roman houses continued to be in use in Donk, but it was the presence of the sunken huts in combination with Germanic material that led to the conclusion that the Roman dwellings were occupied in the Late Roman period. The notion that Gallo-Roman houses could continue into the 4th century with only a local occupation has not been mentioned. It becomes evident that without a 'Germanic factor' Late Roman settlements are hardly found: of the ca. 40 sites and structures known, approximately 40% could be dated in the Late Roman period based on the presence of (suspected) Germanic elements (Figure 47), including sunken hut features, Wijster type houses, exotic handmade pottery, brooches, pins and other dress accessories. In contrast, in only ca. 15% of the cases the possibility of a local continuity,

i.e. non-Germanic, was considered, particularly at Oudenburg, Tongeren, Kortrijk, Vechmaal and Knesselare. Moreover, the presence of people from a Germanic origin is confirmed at Oudenburg and Tongeren, and it is assumed for Kortrijk as well. This might be interpreted as prove -reinforcing the old paradigm- that the only active population in the area for the 4th and 5th century is of Germanic origin. This could be the case, however, it is more likely that this Germanic bias has delivered us with a skewed skill set to recognise the Late Roman period. For instance, the possibility of a 'Roman repopulation', not even in the area around Tongeren, was never mentioned in the literature. Given that Tongeren remained, in the proximity of the imperial seat at Trier, an important focal point in the province of Germania Secunda (see 4.3.5) for at least a century after the supposed dramatic second half of the 3rd century, it seems unlikely that no movement or interaction originating from the south took place in the 4th and 5th century. Theuws (2009) has argued that some Wijster houses might point to a southern migration, but this statement is currently contested (Heeren in press). Additionally, it seems highly unlikely that the entire local population, living and working on the large villa estates or in the rural surroundings of the many *vici* of the early 3rd century, disappeared entirely or that no return migration was attempted, in case they had fled from barbaric incursions and military turmoil. Despite the many hypothetical explanations for the dominant Germanic presence in the Late Roman countryside -and in the archaeological record-, it is clear that no critical assessment of the nature of the Late Roman population was done within the larger narrative of sociocultural change in this part of Northern Gaul.

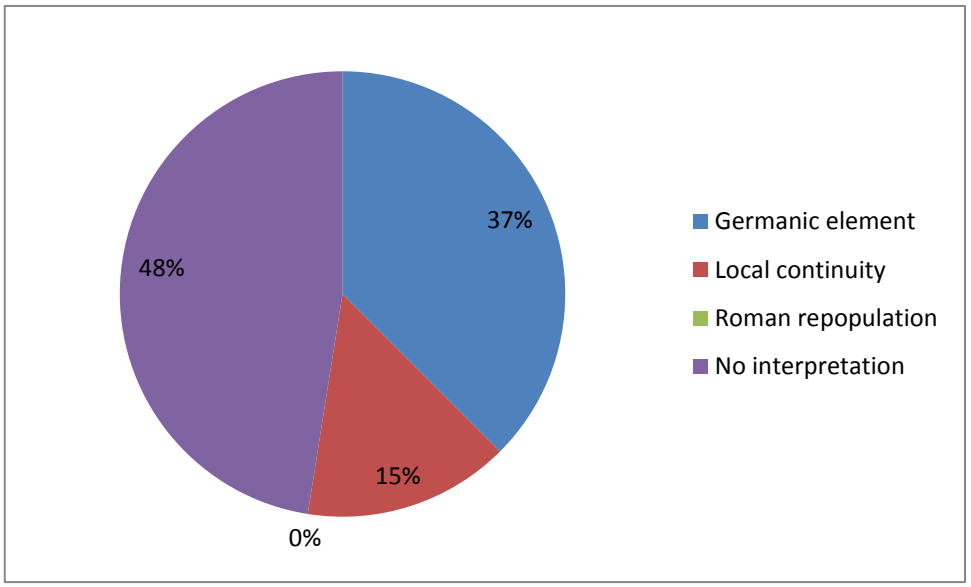


Figure 47 Reasons provided in the literature for identifying sites or structures as Late Roman (n = 40).

With this evaluation, it becomes clear that there are issues of identification and chronology within the Late Roman archaeological record. To constructively work towards a better understanding of what can be defined as Late Roman, we will briefly address the settlements and burials that have been positively identified and dated between AD 260 and 450, i.e. the Late Roman period.

4.4.1.2 Settlements

The most distinctive settlement features are buildings. Houses are often best qualified to assign a date and/or sociocultural interpretation to the site. Only a limited number of excavations in Flanders revealed complete or usable Late Roman house plans, dated by finds and/or radiocarbon dating.

New knowledge of Late Roman house plans in Dutch archaeology aided the identification of these Late Roman buildings in Flanders. These 'Germanic' houses were, until recently, largely unknown (Figure 48) (also see Heeren *in press* for a discussion on these house types). The Wijster parallels are the most common (Van Es 1967), but references to sites as Peelo, Ede and Breda are also occasionally made. Two buildings, matching the Wijster A house type, appear in the Late Roman Inventory of Flanders. The first, Nazareth – Eke 'house 3' is three-aisled, spans minimum 17.9 m by 7.7 m and is NW-SE orientated (Dyselink, report forthcoming). The second, Hasselt – Rode Rokstraat 'house 2' is single- to three-aisled, measures 19.6 m by 6.8 m (Hazen 2014) and corresponds to Wijster A II (Van Es 1967) and Ede B (Taayke et al 2012).

The succeeding type Wijster B - or Peelo A - was encountered in Hasselt – Rode Rokstraat and in Lummen – Meldert. Hasselt 'house 5' measures 42 m by 7 m, but most likely the structure need to be seen as two overlapping phases of the same house or as two houses for which the plans overlap. Each house or phase would be 22 m to 26 m long (Hazen 2014). Meldert 'house 3' has a partly single-, partly three-aisled construction, a NE-SW orientation and measures 13.6 m by 7.7 m (Smeets and Steenhoudt 2012). Also Meldert 'house 4' might belong to the same type. Its orientation is NE-SW and it measures 15.9 m by 6 m. Allthough, it is not entirely clear, it seems to be constructed in the partly single- partly three-aisled fashion. A foundation ditch or beam slot was present as well.

The final Wijster structure found is Hasselt 'house 1', measuring approximately 12 m by 5 to 6 m, is referred to as a Wijster 'shorthouse' (Van Es 1967). The last building to mention in the list of these 'Germanic' houses, is Meldert 'house 8'. Its three- to four-

aisled and measures ca. 14 m by 7 m. Although its typology is not quite clear, a house from Breda-Steenakker could be a parallel (Smeet and Steenhoudt 2012).

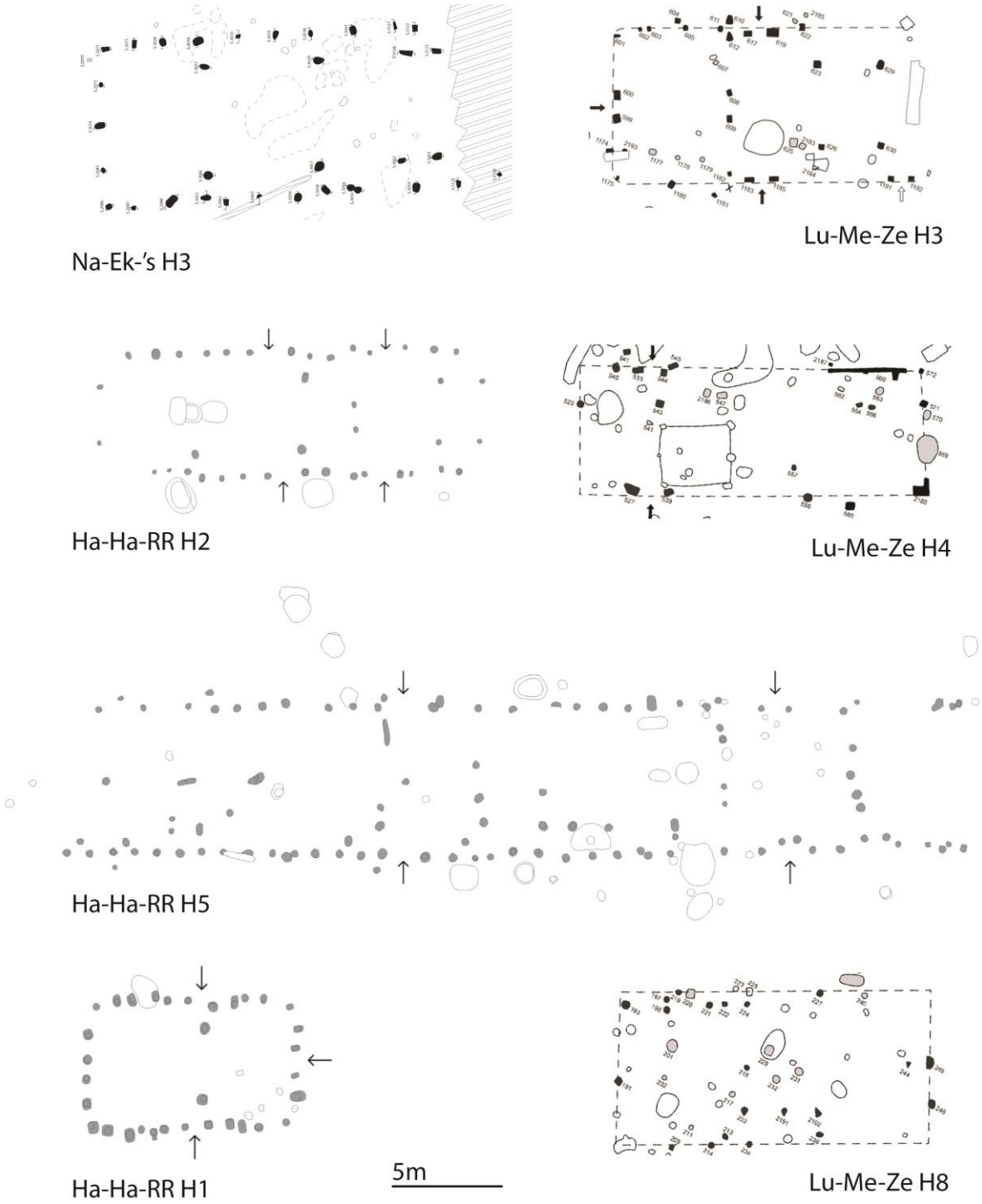


Figure 48 Late Roman 'Germanic' houses encountered in Flanders. House plans after the excavation reports from Meldert (Smeets and Steenhoudt 2012), Hasselt (Hazen 2016) and Nazareth (Dyselinck forthcoming).

Before the discovery of these Wijster-type houses, a Late Roman Germanic presence was mainly established by the presence of sunken hut features, as documented in Donk

(Figure 38), Sint-Martens-Latem (Figure 25), Neerharen-Rekem (Figure 40), Wange (Figure 37), Lummen (Figure 39) and possibly Kerkom. Sunken hut features are very distinctive, making them easily recognisable. Characteristic are a lowered dug-out floor level and an approximate square shape with posts on the outer edges. Their use as working or storage spaces often results in a large amount of finds within their fill. However, these finds are usually connected with the abandonment of the structure.

Not only 'Germanic' houses or structures were characteristic for the Late Roman period, some constructions in line with the late 3rd to 4th century local tradition were encountered as well (for an overview of the different possible types for the 1st to 3rd century, see De Clercq 2009, chapter 10). Two-aisled houses were found at Turnhout and Meldert. Turnhout 'house 7' has a clear central axis, a NE-SW orientation and possible contained a stable (De Smaele et al 2012, 75). Meldert 'house 5' displayed a partial central axis, a NE-SW orientation and measured approximately 17 m by 6 m (Smeets and Steenhoudt 2012).

A number of single-aisle houses were found as well, i.e. at Turnhout and Donk. Turnhout 'house 8' was located alongside 'house 7'. It was a rectangular building, measuring approximately 19 m by 8.8 m and NE-SW orientated. Additionally, two entrances on the long sides were noted (De Smaele et al 2012, 106-107). Three single-aisle houses (J, I, K on Figure 37) from Donk are thought to have been re-occupied by new settlers (Van Impe 1983). The buildings themselves are believed to have been constructed in the 3rd century, corresponding with their rather traditional local construction technique.

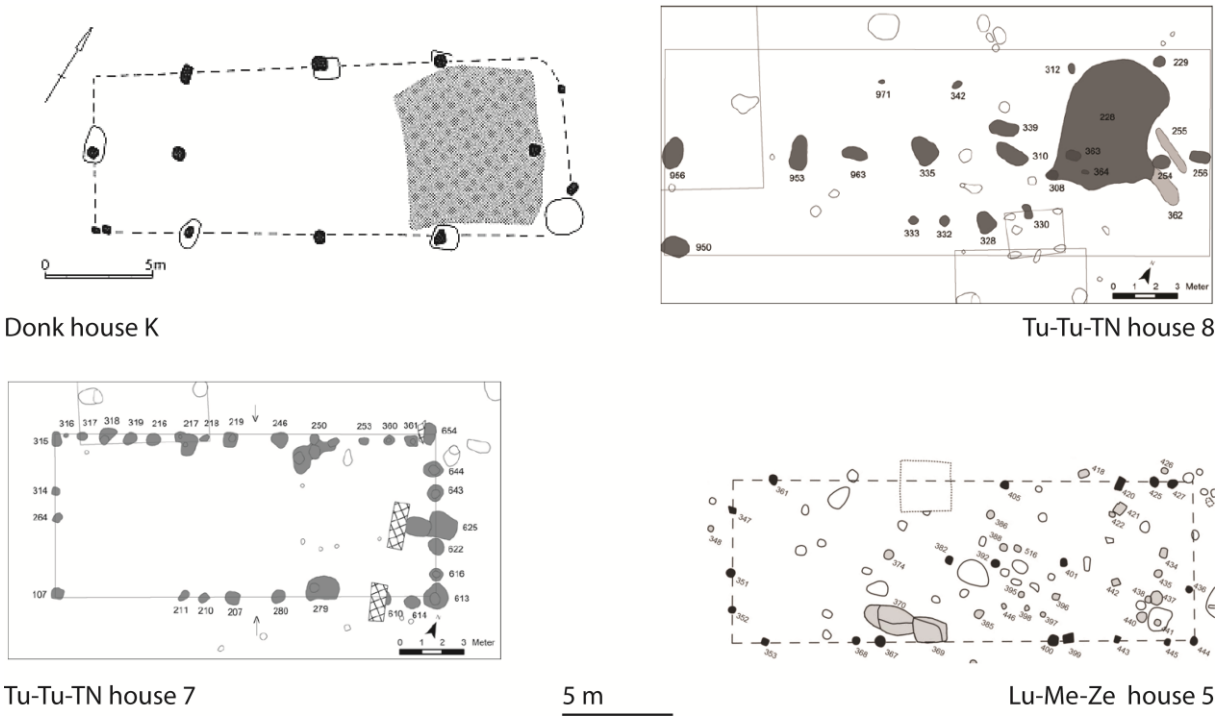


Figure 49 Late Roman houses constructed in local tradition (house plans after De Paepe and Van Impe 1991; De Smaele et al 2012; Smeets and Steenhoudt 2012).

Despite the quite large number of finds within Flanders, not many settlements are excavated or positively identified. The main reasons are chronological issues and the Germanic bias, making it very difficult to trace local continuity. However, as Nazareth, Turnhout and Donk prove, these settlements existed, with or without Germanic components. Essential for future excavations is to redefine the parameters of what is considered as Late Roman and, if no evidence points to the opposite, to let a 3rd century occupation go beyond the AD 260/270 barrier. This way, the end of the 3rd century can be re-integrated in the Roman history of our region and the gap between Mid-Roman and Late Roman can be reduced.

4.4.1.3 Burials

Another good way to track an active population is through their deceased. However, when the burials dated to the Late Roman period in the Flemish archaeological record are plotted, another issue appears. The large burial grounds around Tongeren and the burials along the roads in its direct vicinity (e.g. Riemst and ‘s Herenelderen) confirm the presence of an active population in the late 3rd to 5th century. Tongeren’s northeast and southwest cemeteries have been proven to remain in use for the entire Roman period (see 4.3.5.1). Additionally, the burials of Neerharen-Rekem, Kinrooi, Wange and Landen also confirm active people, living on the rural settlements in the larger vicinity of Tongeren.

Outside the eastern part of Flanders, the burial ground from Oudenburg, with 4th century inhumations, has been only well-documented burial site. In its direct vicinity, at Roksem-Zerkegem, also a few Late Roman burials have been found. Besides these, no burials were securely dated between AD 260/270 and 450.

The first reason is probably the notion that Late Roman burials only appear as inhumations. Van Doorselaer noted already in 1964 that cremation was a continued practice in the 3rd and 4th century and also Vanvinckenroye sporadically mentioned Late Roman cremations in and around Tongeren (see Appendix 1). Apparently, this knowledge was lost, perhaps along the pursuit of 'Romanisation' (see 4.1.1 Historiography). Furthermore, in some cases, inhumations without grave goods have been attributed to the Late Roman period (e.g. Hoeselt), however an Early Medieval date could be just as likely. Arguably, inhumations with grave goods are more likely to be Roman, due to the imbedded practice of grave goods or the consumption of material culture in the burial rites. Moreover, the notion of inhumation as the sole Late Roman burial rite was connected to the Germanic bias causing inhumations with (unfamiliar) grave goods to be interpreted as Germanic. The misguided interpretation of the so-called weapon graves (Halsall, 2012; Theuws 2009) has already been mentioned, as well as the disputed Germanic identity of the female burial in Kerkhove (see 4.3.3). The emergence of weapon graves is now approached from a social rather than from an ethnic perspective. Halsall (2012) and Theuws (2009) have argued that the weapons found in the graves were of Roman manufacture. The fact that the burial custom among Germanic societies was cremation and that these weapons were found in inhumation graves argues for a Roman construct (Halsall 2012, 31-34). Given that the inhumation burial can be seen as a ritualised communication of privileged groups and the weapons are limited to hunting, a Roman elite practice, these graves must be seen as expressions by a Romanised elite, probably to lay claim to deserted lands (Theuws 2009, 309-314).

In this light, the cremation rite needs to be prolonged and be seen as part of the variety of Late Roman burial rites, both as a local Gallo-Roman and as a Germanic tradition. Evidently, inhumation remains the most important burial practice in the Late Roman period, but it needs to be approached with caution in assigning chronology by absence of grave goods or in matters of assigning a cultural or ethnic identity to the deceased.

4.4.1.4 Late Roman identification

We can conclude that many factors hinder the positive identification of Late Roman sites and features in the archaeological record. First, there is only a small variety of easily datable material culture and a difficulty in accurately dating or assigning the categories that are present, such as handmade pottery. Related to this is the possibility of increased importance of archaeologically invisible commodities in the local economy. Second, the dominance of the historical decline discourse for the 3rd century prevents continuity into the late 3rd and early 4th century as a possible interpretation. Here it is important to refrain from using the AD 260/270 barrier as a *deus ex machina* to easily explain the end phase or abandonment of a settlement. Third, the 'Germanic bias' or the focus on Germanic aspects of the Late Roman society of Northern Gaul hinders the gain of knowledge of local Gallo-Roman communities and underestimates the importance of continued traditions, as well as the actions of possible remaining or new (local) civilian or military elites. Fourth, the more dispersed nature of the Late Roman rural settlements. Often only one or two houses or separate structures, such as wells, are found, indicating the existence of dispersed, small scale settlements. These solitary communities remain fairly invisible in the archaeological record due to their scale, but also due to their frequent location underneath modern town centres, resulting in a rather fragmented state of knowledge. Although, this complicates tracing Late Roman settlements, it has become clear that connectivity was a key determining factor for continued occupation or the choosing of land to settle on. Fifth and last, the skewed image of the Late Roman burial rite needs to be reconsidered, especially with regards to the rural communities on the sandy soils in the Scheldt basin. Not only inhumations are part of the burial practice, but cremation can be expected to have been carried out by both Gallo-Roman and Germanic communities.

4.4.2 Persistence of paradigms

The traditional view for the Late Roman period applied to the archaeological record of Flanders is mainly based on historical narratives. In most interpretations, the late 3rd century is not regarded as an inherent part of the Late Roman chronology. Mainly, the 3rd century crisis is applied as a clean break after which the Late Roman component can start at the beginning of the 4th century. The third quarter of the 3rd century - or the date of AD 260/270 - is often assigned as the end date of Roman settlements and activity (e.g. Rogge, Thoen, Vermeulen 1990, 63). The barbaric incursions are frequently cited as the reason

for these abandonments (e.g. De Cock 1996, 85). Resulting from this threat, a military response (e.g. Vanderhoeven 2012, 143) and reformation (e.g. Thoen 1989, 72) was launched at the start of the 4th century causing the militarisation of Northern Gaul of what was, essentially, an 'empty' landscape (e.g. Thoen 1987 or Roumegoux, Termote 1993, 77-78). This void was gradually resettled by Germanic immigrants, often seen as the prelude of the historically attested mass migrations in the 5th century (e.g. Lodewijckx 1991, 47) followed by the emergence of the early Medieval kingdoms. The general attitude towards these ca. 200 years of history is that of a declining society (following Gibbon) in which an advanced state-civilisation is replaced by a less coherent or organised feudal society.

This short summary of the general historical narrative contains a number of paradigms which could be construed as obstacles when they are uncritically copied in the archaeological interpretation. In the following sections, we will focus on how these paradigms obscure the identification of Late Roman archaeology.

4.4.2.1 3rd century crisis

In general books on Roman history (e.g. Naerebout and Singor 1995), the 3rd century crisis is a fixed label to refer to the period ca. AD 235-280 that marks the end of the mid-Roman period. This crisis is considered to start after the breakdown of the *Pax Romana* from the 1st and 2nd century due to internal and external troubles. The 3rd century is known for its many military usurpers and civil war, causing economic instability and separatist dynamics, as is illustrated by the Imperium Galliarum for Gaul. The external threat consisted of a number of Germanic alliances, such as the Goths, Alamans and Franks and is considered as a major contributor to the 3rd century turmoil, especially for Northern Gaul. As is illustrated by Nouwen (2006, 36-37), who states:

> 'Especially 258-289 was a time of disaster. The Franks crossed the Rhine north and south of Cologne, overran Germania Inferior, destroyed numerous military camps and civilian settlements, and pushed through as far as Spain.'

Evidence for this event is traditionally found in coin hoards, abandoned villas and destroyed settlements. The frontiers are considered to have become fragile for the Gallic and Germanic provinces, as proven by the coastal raids. The Imperium Galliorum provided a temporary phase of stability ca. AD 260-273 by monetary economic recovery and restoration of (claimed) Roman authority. Nevertheless, after the death of Postumus, the raids recommenced and the coastal plain became abandoned around AD 268-270.

Moreover, a major destruction event took place ca. AD 275-276, destroying Trier, Tongeren, Nijmegen, Tournai and all major villas and *vici*, leading to large scale abandonment:

> 'At the end of the 3rd century Gaul was a devastated province with destroyed towns, villas and settlements.' (Nouwen 2006, 38)

These notions provided to us by historical studies are very finite in considering the 3rd century crisis. Influenced by Gibbon (see 2.1), this is often a closing chapter for the mid-Roman period and provides a clean break with the Late Roman period or Late Antiquity.

Archaeologists studying on or excavating in the areas of Northern Gaul followed this historical narrative in the manner that they have assigned much value to the phase between AD 260 and 275 as an end date for Roman settlements, population and often activity as a whole. Although, historically, there are plenty good arguments to regard this period as a transition between two phases of Roman history at this point. The main argument here is the start of the Tetrarchy. However archaeologically speaking for Northern Gaul, this delineation has to be approached with caution. For instance, right after the large destruction phase, it is noted in the *vita Probi* that Probus drove all the Germanic raiders out of Gaul ca. AD 276-282 (Nouwen 2006, 38). After which the reforms of the Tetrarchy already take into effect and reinforced the frontiers. Carausius was successful in handling the coast raiders and pirates with the *classis Britannica* around AD 283-285, followed by successes of Constantine Chlorus and Maximian against 'barbarians'. They are both praised in AD 291 and 297 for victories against the Franks and the 'cleaning' of the Scheldt-Rhine area (Nouwen 2006, 39). Moreover, Constantine Chlorus had to undertake action against Carausius, who had become an usurper, and restore Britannia as part of the Roman Empire.

These conflicts pertaining to barbarian incursions, usurpations and re-establishing Roman power are no different from the decades preceding the supposed large abandonment at ca. AD 275. Although the imperial politics have changed, it can be argued that, archaeologically speaking, the final quarter of the 3rd century in Northern Gaul was characterised by the same processes and dynamics as the preceding 50 years.

Over the course of the past two decades, this general historical narrative has been reviewed and adjusted on regional scales where the focus is put on social, cultural and economic processes as contributing factors to the 3rd century crisis. For instance, the large debate on Romanisation also yielded an explanation for the changes of the 3rd and 4th

century. Halsall (2007, 71-74) argues a differentiated aspect of Romanisation, in which every provincial and regional culture had been incorporated in the large concept of what it meant to be Roman. The provinces manufactured their own material expression of Roman culture, which had an impact on the aspects that tied the wide diversity of the Roman Empire together into a single and stable unit. One of these aspects was the end of citizenship at the start of the 3rd century. Because citizenship was removed as a driving factor for social competition, interest in public investment was lost. This provides another angle on the decline of towns than mere abandonment out of fear. Another example is the observation that in many regions of the Roman Empire the regional economies could not hold pace with the increasing degree of urbanism in the 2nd and early 3rd century, delivering an internal cause for the collapse of the rural systems.

By investigating aspects of economic, social and cultural change the 3rd century narrative for Northern Gaul is altered[7]. It is now recognised that the initial boost derived from the incorporation in the Roman Empire or the Mediterranean developed into stimuli on a social and cultural level that were expressed through material culture, until these were 'played out' in the later 3rd century by which time they were replaced by new mechanisms (Esmonde Cleary 2013, 311-312). Despite that the civil wars are considered to have caused economic inflation (cf. coin hoards), many parts of the Western provinces remained prosperous (Hallsall 2007, 71-74) and the 'Roman' deterioration of Northern Gaul has to be placed after the Gallic Empire (Drinkwater and Elton 2002), i.e. a reduction on an economic level and the redefinition of social practice.

The external threat has not been denied or neglected though. The 'barbarian confederacies' remain an important aspect of the Late Roman threat, although this is considered to have arisen from the absence of a coherent foreign policy in the 3rd century (Halsall 2007, 74). In line with violence, the addition of bandits or *bagaudai* can also be mentioned (Drinkwater 1992).

In order to contribute to the archaeological sociocultural understanding of the late 3rd century of Northern Gaul, we can propose either to mark the period after AD 260 as a significant part of the Mid-Roman period as the end or prolonging of the traditional Roman sociocultural processes and constructs referred to as Romanisation; or to

[7] For a complete discussion on the evidence and interpretation of the 3rd century crisis see Esmonde Cleary 2013 18-41.

incorporate the mid-3rd century and the '3rd century crisis' as the initial phase in the changing mentalities of the Late Roman period. This suggestion does not in any way deny the external (and internal) military threats, nor the political instability or economic crisis of the 3rd century. It signifies merely an adjustment in approach to study changes in social and cultural dynamics. Practically, this consists of breaching the AD 260/270 barrier when there is no direct evidence indicating the end or abandonment of a site at this time and extending the general 3rd century chronology to the actual end of that century, i.e. AD 300.

4.4.2.2 Germanic bias

The 'Germanic bias' has been referred to while considering the recognisability of Late Roman sites and material culture in Flanders. This bias resulted from the initial assumption that there was a complete abandonment of the entire region around ca. AD 275, caused by large scale destruction of the land, right after the disbandment of the Gallic Empire (see above). This depopulated area was considered to be gradually or drastically repopulated by Germanic people over the course of the 4th century. One of the major contributions to this notion is the reference of Ammianus Marcellinus on the meeting of Julian with the Salian Franks in Tongeren ca. AD 358 to confer on their illegal residence in the area and to grant them permission to reside here (AM XVII.8). In addition to these 'allied Franks' (cf. Vermeulen 1992), we can also presume the presence of Germanic soldiers in the Roman army as Germanic 'mercenary groups'. Apart from these 'allied contracts', more destructive barbarian incursions are known as well. All these elements indeed point to a large presence of Germanic people inside the Roman borders for various reasons. However, this point of view and labelling has its roots in the ethnicity discourse, which is in a lesser degree still present in the cultural comparison of group identities. It is far too often based on a contradictory use, i.e. Roman vs. Germanic in this case. Over-simplified, this would make the major population on the sandy soils of Northern Gaul Germanic in nature, while the provinces of Belgica Secunda and Germania Secunda remained official administrative entities of the Roman Empire within the acknowledged official Roman frontiers. It is clear that a very differentiated situation is present from the 3rd to the 5th century in Northern Gaul concerning the exact nature and relation of these

Germanic individuals, groups or communities with the various layers of the Gallo-Roman society[8].

Furthermore, a note can be made on the scale of the Late Roman barbaric incursions and raids into the test-case of Flanders. First of all, it has to be clarified that archaeology is not the ideal tool to trace 'quick' events, such as a swift raid. The evidence is scant and almost non-existent if these incursions did not cause significant destruction that can be seen in the archaeological record, such as burn layers. Coin hoards have often been seen as 'fear mechanisms' supposedly pointing to events of invasions, although much more explanations are possible (Heeren 2015). In addition, the concept of the 'Germanic threat' has been widely discussed and is in certain cases argued to have been overestimating the seriousness or scale of these events. For example, Gerrard proposed some convincing arguments for the case of Britain concerning references from Ammianus on the Picts, Saxons and Scots, pointing out an intentional exaggeration to support other interests (Gerrard 2031, 17-26). In line with this debate, is the question whether the large scale migrations were the cause or the result of the 'fall' of the Late Roman West (e.g. Ward-Perkins 2005; Halsall 2007).

As stated earlier, this focus on the Germanic aspect of Late Roman society caused a neglect of the potentially continued Gallo-Roman tradition, making it difficult to identify it and therefore confirming the traditional view of abandonment. For instance, an active and thriving civilian habitation is attested for the town of Tongeren (see 4.3.5.1), but these inhabitants are considered no more than mere passive spectators in the Late Roman society. Furthermore, it is suspected that the local elite possessed urban residences within the town walls and the presence of an early Christian Bishop implies a connection with the Roman aristocracy. It is unlikely that they remained inactive during multiple threats by barbarian incursions, the presumed destruction of the entire town and the arrival of new Germanic settlers in the surrounding landscape. A similar argument can be made for the down-scaled, but continued, rural communities in the Scheldt basin. It appears that, similarly to the development of the Romanisation debate, it is difficult for local traditions to be considered as a significant and active part of the Late Roman society in the Flemish archaeology.

[8] For a full discussion on the matter see Heather 2005 and Halsall 2007.

4.4.3 Towards a new Late Roman landscape in Flanders

Rather than to focus on the aspects of decline and abandonment of Late Roman society in Northern Gaul, this study attempts to constructively increase awareness of alternative models for looking at the Late Roman archaeological record in Flanders. The main results from the detailed review of the different areas or micro-regions from the Flemish case-study will be briefly summarised here.

First of all, some trends concerning the main locations of Late Roman sites and finds were observed. Overall, a strong degree of connectivity appears to have been a decisive factor in the continuation of local sites as well as choosing the territories for repopulation. The main areas containing active Late Roman settlements are the Scheldt basin and the region around Tongeren. The habitation of the Scheldt basin appears to have been diminishing in the 3rd to 4th century, given the reduction in the number of sites. Nevertheless, on a smaller scale and concentrated along the rivers and roads, a continued population remained in this area (e.g. Kortrijk, Kruishoutem, Nazareth) and sporadic reoccupation also occurred (e.g. Asper, Sint-Martens-Latem, possible Bachte-Maria-Leerne as well). Mainly a rural character can be ascribed to this micro-region, although some economic-military aspects can be derived as well. Given the large road network and many navigable rivers, accessibility to a regional economic network is not unlikely. Furthermore, the land-connection with the more militarised zone to the northwest (e.g. Oudenburg and Aardenburg, possibly Knesselare) also indicates the presence of military traffic, either in troops or goods. An actual permanent military occupation on the river Lys has often been suggested (e.g. Kortrijk and Gent), but has yet to be confirmed. Additionally, it appears that the concentration of sites and finds diminishes along the course of the Scheldt, with higher concentrations towards the south than northeast. An explanation can be found in the possible remnants of local elites and/or the proximity to the centres of Belgia Secunda to the south (e.g. Boulogne, Bavay, Tournai). Overall, despite the reduced scale, it appears that the Scheldt basin, and especially the Lys valley and Scheldt-Lys interfluvium, remained connected to a regional economic network, most likely south towards the rest of Belgica Secunda. In addition, a military and associated administrative connection can also be argued between the coastal military zone and the hinterland.

The second mainly continued populated area is located in and around Tongeren. The former *civitas* capital can fairly confidently be regarded as a continuous occupation.

Whether this holds true for its local network or not is less evident, given that the focus on the main residential buildings of the villa estates left us with little knowledge on possible continuity of other rural communities in the direct vicinity of the urban centre. Nevertheless, the cemeteries aroudn Tongeren yielded evidence for a complete mixed urban society of civilians, soldiers, Romans, Germanics, and early Christians. The presence of a bishop already in the Late Roman period even indicates a connection with Roman aristocracies. In addition, state and administrative facilities can be assumed, indicating the state officials, civilian and military elites would have resided inside its walls. Whether there was a permanent military residence in Tongeren itself is unknown, but its location on the axis between Boulogne/Bavay and Cologne, as well as its connection to Maastricht, at least points to military traffic of soldiers and goods. Again, the place of Tongeren in the network of Germania Secunda has to be considered, with adjacent navigable rivers such as the Meuse and good road connections to Maastricht, Nijmegen, Tournai, Bavay, Cologne and even a connection to Trier is not unimaginable. As for Tongeren's local network, the surrounding area within a radius of ca. 30 to 50 km revealed a number of new Germanic rural settlements along the roads and rivers. This pattern is unlikely to be a coincidence. Either the new settlers chose these locations for a combinations of reasons pertaining to connectivity, accessibility and soil properties; or an organised attempt to repopulate the surrounding rural hinterland to support the urban society of Tongeren can be argued as well. In any case, these new settlements (e.g. Meldert, Hasselt, Neerharen-Rekem, Wange), either strictly Germanic or mixed with local people (as is perhaps the case for Donk), all appear to have been constructed in the second half of the 4th century or early 5th century. Whether or not these are (Salian) Franks cannot be distinguished from the archaeological evidence alone. A connection with the actions of *caesar* Julian and the events of ca. AD 358 can be made, but we remain cautious in ascribing such a label, given that only one historical source provides us with this information. In general, it is quite clear that the local network of Tongeren would have undergone a change in its economic model, given the disappearance of the villa-based system.

Supporting the importance of connectivity as a decisive factor for Late Roman occupation, is the apparent deserted areas in the southwest of Flanders (Heuvelland and the Yser basin) and the Campine region. These appear to have been less well accessible by river or road, which was possibly unappealing in the different economic and societal circumstance in Late Roman society. However, the settlement pattern itself appears to

have shifted from a nucleated to a more dispersed system of dwellings. These are less visible in the archaeological record, and given the identification difficulties, possibly are not recognised when they are encountered.

In conclusion, we can state that the test-case of Flanders has revealed that large parts of the landscape were still actively connected to existing networks and possibly provincial structures, albeit on a smaller scale in comparison to the 2nd century and mostly determined by accessibility by roads and rivers. Local economic systems can be assumed, although, to what extent these were continued existing models on a reduced scale or newly developed methods for exchange and trade is yet unclear. Despite the limitations in detecting Late Roman archaeology in the Flemish landscape, new sites are still encountered and a progression in recognisability is seen by the increased knowledge on Germanic settlements. However, we have to remain cautious not to be biased or solely focused on the Germanic element of the Late Roman society and further explore the diverse sociocultural developments for both local Gallo-Roman traditions and non-local Germanic aspects, as well as the result of their interaction, for the 3rd to the 5th century. The social and cultural aspects of the people living and acting in Late Roman Northern Gaul will be further explored in the material culture case studies.

Part 3 Aspects of Late Roman society in Northern Gaul

5
Methodology for the material culture studies

This chapter will provide the shared methodology for all three material culture three case studies in which the object or artefact is the central focus. The part following the general object-based approach elaborates on the scientific background, method and interpretative framework of ceramic petrography and handheld XRF on copper-alloy objects. The final section will briefly consider the reasons for choosing these techniques for the respective material culture.

5.1 Object-based material culture

For archaeology, material culture forms the essence of the research focus. The things left behind by people from the past are our primary source of knowledge and by studying a wide variety of material culture, ranging from portable objects to immense structures, we are able to reconstruct aspects of a former society (see chapter 2). Material culture is a very wide concept and is not restricted to artefacts, structures or buildings, but even includes landscapes shaped by the presence of man. Therefore this study applies the term of 'object-based material culture'. This emphasises that objects or artefacts[9] are the starting point of the studies presented in the following chapter, but also indicates that

[9] The terms 'object' and 'artefact' are used interchangeably here and do not express a specific connotation connected to any theory or approach.

the object itself does not remain the sole focus. All information available concerning an object is considered as layers of information, all contributing to revealing the significance of a specific object, artefact type or collection of archaeological finds. Because of this, an object-based material culture study is multidisciplinary by definition and considers all aspects connected to objects or artefacts in an equal manner. This included the object itself, its context, possible references in written or illustrative sources and models in which they play a key-role.

For the following chapters, the combination of information obtained by archaeology, archaeometry, history, art-history and anthropology will be combined to pursue new insights into artefacts that reflect different aspects of the Late Roman society in Northern Gaul.

5.1.1 Material culture approach: from object to interpretation

In the following three object-based case studies (Chapters 6, 7 and 8), a consequent methodology of study is followed[10].

Before commencing any kind of analyses, the state of research is evaluated for every class of objects. This provides the general framework of knowledge on the specific material culture.

The actual first step is the identification of the object or class of objects within the classification or typological systems of the specific class of object. Depending on the state of knowledge, this can vary from a very detailed classification to merely a general label. For instance with Late Roman ceramics, on the one hand it is possible to identify the samian (terra sigillata) bowl type Chenet 320 to a specific type of roulette decoration, where on the other hand handmade pottery often cannot be distinguished further than local or not-local. The artefacts in this study were of course known and identified, although a detailed typological review has been performed for all three case studies in order to provide the most detailed identification possible.

After documenting all available features on the object(s) – such as shape, style and dimensions - and classifying them with the appropriate labels provided by typologies, the

[10] Introductions and methodologies concerning material culture studies can be found in Caple 2006 and Harvey 2009.

next step considers the contextual factors. The most obvious is the archaeological context, in which the find circumstances are recorded and provide indications on the consumption or production of that specific material culture. Besides the find context, the historical and art-historical context can additionally have an important role. Both its presence and absence from written or illustrative sources can give indications towards the sociocultural interpretation of the artefact class.

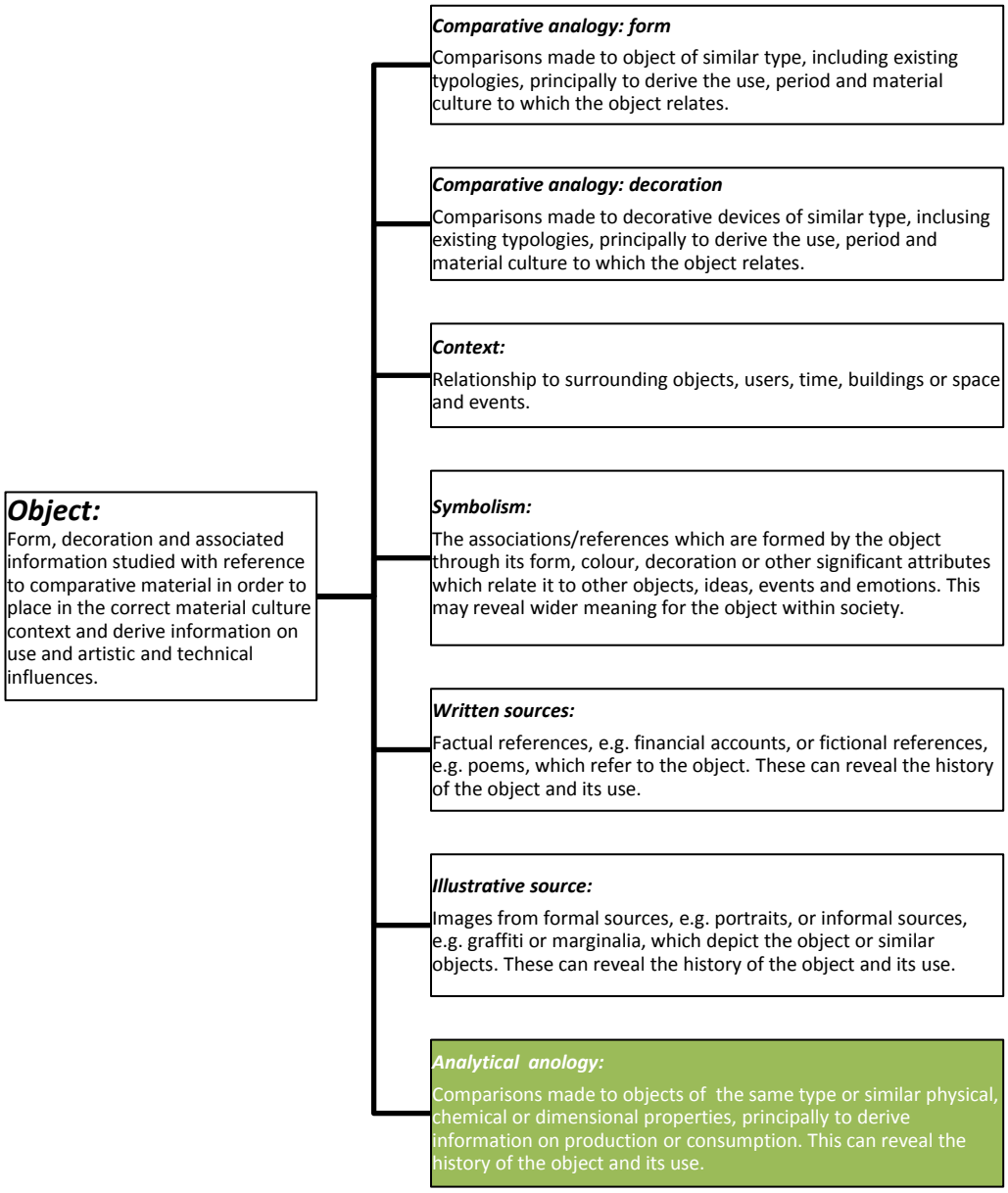


Figure 50 Material culture analysis diagram: listing the different layers of analyses starting from the object (after Caple 2006, 22, fig. 1.4; with addition of the last box by the author).

The next phase is the analytical phase. Here, we applied specific analytical techniques in order to have an archaeometrical layer of information for the studied artefacts. These

always have to be considered complementary with the traditional archaeological analyses on style, distribution and chronology. From these analyses a first interpretation is given based on the results, often concerning matters of production and/or consumption.

Finally, these interpretations are submitted to the relevant archaeological, historical and anthropological models in order to contribute to the larger narrative of, in this case, the Late Roman period of Northern Gaul.

5.2 Applied analytical techniques: method and theory

In the following part of this chapter, a brief elaboration on the scientific background and methodology will be provided for the ceramic petrography[11] and the handheld XRF analyses. Additional attention has been given to the limitations and potential of each technique for the specific material culture that has been studied here. Finally, this section ends with a discussion on the selection of these analytical techniques.

5.2.1 Ceramic petrography

Generally, ceramic petrographic analysis detects and documents the composition of ceramics and investigates patterns in pottery assemblages. This reflects the raw materials and the techniques that were used to make the ceramic vessels and deliver insights on provenance and technology. On the one hand, provenance provides us with information on where the clay or pot originated from and can be interpreted in terms of movement such as trade, exchange, distribution and migration. On the other hand, technology reveals how the pot was made and reflects not only production and function, but can also inform us on craft tradition, transmission of knowledge and social expressions.

[11] Corresponding to the Thin Section Petrography of Archaeological Ceramics course given by P. Quinn at the Institute of Archaeology, University College London.

5.2.1.1 Optical mineralogy

Ceramic petrography applies optical mineralogy in order to analyse the composition of ceramics by using a polarising microscope with plain polarised light and crossed polars to examine thin sections. Optical mineralogy is the study and identification of minerals in thin sections, which examines their morphology and optical properties (Rice 1987, 377-379; MacKenzie and Adams 1994, 9; Orton, Hughes and Hughes 2013, 163-164; Quinn 2013, 33-35) In thin section, at 30 µm, most rocks and minerals become translucent, which allows them to be studied by light that passes through the minerals. The polarising or petrographic microscope uses a rotating stage and two polarised filters to do so. Visible light, consisting of electromagnetic waves with specific wavelengths, vibrates in all directions. When the visible light is passed through the first polarised filter – called the 'polariser' – it becomes limited to only one plane of vibration. This mode is referred to as 'Plain Polarised Light' or PPL. When the light passes through the second polarising filter – called the 'analyser' – at a 90 degree angle from the first filter, the light is blocked. This mode is called 'Crossed Polars' or XP.

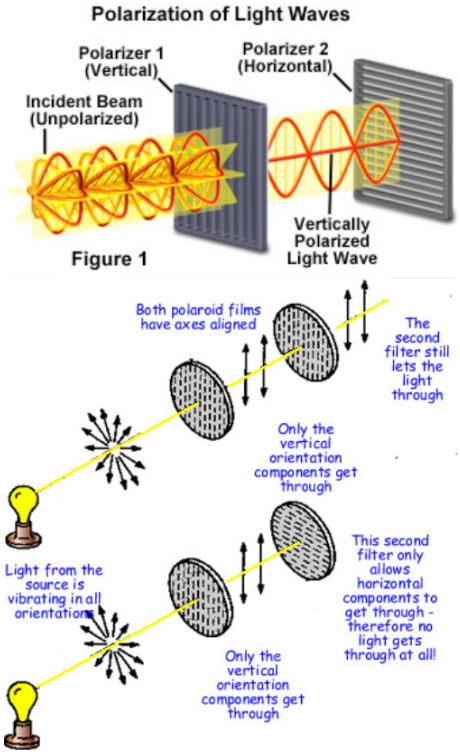


Figure 51 Light directionality through polarised filters: plane polarised light (PPL) after the first filter and crossed polars (XP) after the second filter positioned at a 90 degree angle in comparison to the first filter (after Ceramic Petrography course by P. Quinn 2014).

However, when light passes through a mineral, it alters. Mostly the light is split in two rays that vibrate perpendicular to each other, enabling the light to pass through the analyser. This concept is called birefringence. When the light emerges from the mineral it gives a specific colour which is referred to as 'interference' in XP. These interference colours are part of the mineralogical properties that are studied in ceramic petrography in order to classify the minerals and rocks included in the pottery. The main diagnostic properties of minerals studied in ceramic petrography are:

- Colour: the absorption colour in PPL and the interference colour in XP;
- Pleochroism: the changing of colour when rotated in PPL;
- Relief: the contrast between a mineral and its surrounding minerals;
- Form: minerals have a crystal shape and a distinction is made between euhedral (well formed crystals) and anhedral (poorly formed crystals);
- Cleavage: lines of weakness in certain minerals among which they split when breaking down;
- Transmission of light: anisotropic minerals exhibit birefringence and are visible in XP, isotropic minerals lack birefringence and appear black in XP;
- Extinction: anisotropic minerals vary in colour intensity when rotated in XP and will go completely black every 90°;
- Twinning: this occurs when different parts of the same mineral go into extinction at different times.

These different characteristics aid the classification of the minerals in the ceramic thin section, but also reveal information on the geological formation and weathering of the minerals, as well as the firing conditions of the pottery. The first two are essential for assigning a provenance whereas the last is indicative for technology, which is combined with other characteristics of the inclusions (see below) (for a more detailed introduction on optical mineralogy, see Kerr 1977; Adams, MacKenzie and Guilford 1984; MacKenzie and Adams 1994).

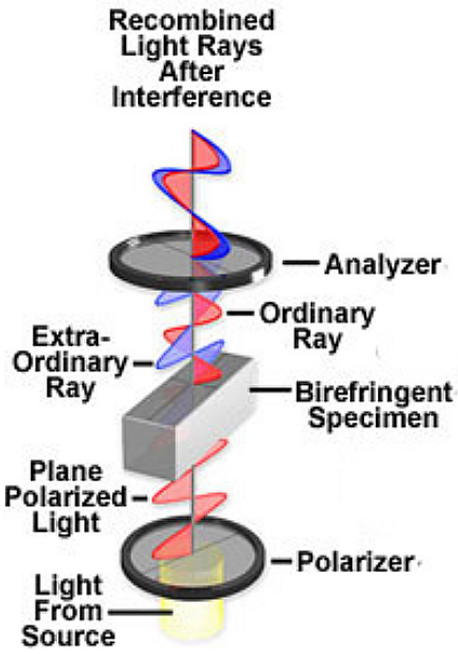


Figure 52 The process of birefringence in optical microscopy with two polarising filters (after Ceramic Petrography course by P. Quinn 2014).

5.2.1.2 Thin section preparation

Thin sections are slices of 0.03 mm thick taken from the ceramic vessel. A sherd is submitted to a preparation process in order to obtain a thin section. First the sherd is sawn or clipped into a small sample, also referred to as a 'chip', which is still large enough to be held by hand. The directionality of the break can vary, but usually a horizontal or vertical direction in comparison with the rim is preferred. To ensure a clean and straight fracture the sample is further cut by a precise saw. Because of the fragile nature of ceramics it is often required to impregnate the sample which fills the pores with a transparent resin, either before or after the cutting. After the impregnation the sample is polished flat to provide a smooth surface for the microscope slide. The remainder of the sample is then cut of and grinded down to the required 30 µm or 0.03 mm, after which a cover glass is put on the remaining side (Quinn 2013, 23-33).

5.2.1.3 Ceramic composition

Once a thin section has been made from the sample, it can be studied under the optical microscope to determine its composition. A ceramic thin section is evaluated based on the clay matrix, the inclusions and the voids. The matrix is the main component of a fabric or paste and consists of the clay, which is the weathering product of the decomposition of rocks containing alumina-rich silicate minerals. Clay minerals (< 2 µm) are too small to

be visible individually under a polarising microscope and appear as a brown homogeneous mass – both in PPL and XP – in ceramic thin sections due to its translucent properties at 30 µm (Quinn 2013, 39-44). However, varying circumstances can cause the matrix to appear different, such as the composition of the matrix and the firing atmosphere. Moreover, the matrix can appear heterogenic rather than homogeneous due to the mixing of multiple clay sources, which can be both natural or intentional, or other aspects of the clay preparation process.

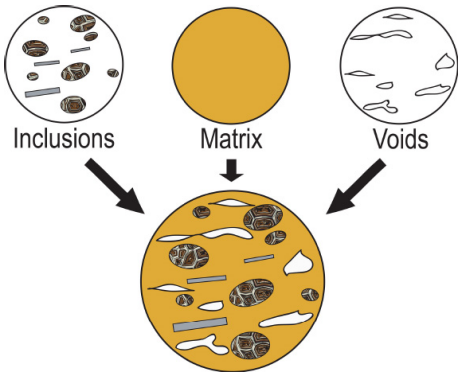


Figure 53 Schematic representation of the ceramic composition in thin section, comprising of inclusions, the clay matrix and voids (after Ceramic Petrography course by P. Quinn 2014).

The most distinctive aspect in a thin section are the inclusions. In general, ceramics containing few inclusions are considered fine pottery and much inclusions indicate coarse pottery. Often the inclusions take up ca. 10% to 40% of the composition and can also be natural, added as a temper, or a combination of both. Most inclusions are called 'non-plastics', such as minerals, rock fragments, iron rich materials, shell, plant, bone, microfossils, grog and slag. More clay rich features - or textural features - such as clay pellets, are referred to as plastic inclusions. Of these elements, only grog, bone and slag are unlikely to occur naturally in the clay and can therefore be seen as an added temper. Minerals and rock fragments are encountered in every ceramic sample, because these have derived from the weathering of sedimentary, metamorphic and igneous rocks which is the process to create clay. The minerals and rock fragments in ceramic samples can often have a different appearance compared to geological samples due to weathering, clay preparation processes and firing. These processes cause the mineralogical properties, such as colour or angularity, to change. Organic inclusions such as shell and microfossils can either be imbedded in rocks or clay or can be added intentionally. Also plant material can often be attributed to a natural inclusion, rather than a temper. When plant matter, often grasses, are abundantly present, it is often referred to as 'chaff'

temper. All inclusions are documented in detail on their frequency, grain size and shape, angularity, distribution, spacing, orientation and their relationship to each other. Mainly, inclusions smaller than 10 µm are considered part of the matrix (Quinn 2013, 44-61).

The final aspect of the composition of ceramic vessels are the voids. These are pores that occur during the manufacturing of the pottery, but can also be the result of the thin section preparation. In general, they take up less than 30% of the composition, although it can be more abundant, and the general percentage of voids is referred to as 'porosity'. The porosity of a pot can be an accidental feature, but can also be an intentional effect, such as for ceramic vessels in which conductivity, seepage or shock resistance is important. The voids are usually created during the processing of the clay paste or shrinkage due to the drying of the clay. Also bloating pores occur, which are indicative for a very high temperature. Mainly the shape and dimensions of the voids are documented, although the orientation can also hold information on the forming of the pot and the secondary fill (often calcite) can inform us on the burial of the ceramics (Quinn 2013, 62-68).

5.2.1.4 Grouping and characterisation

The analytical phase of ceramic petrography is the grouping and characterisation of the thin sections, which investigates compositional patterns. A qualitative approach starts by grouping the samples followed by describing them, while a quantitative approach gives precedence to description over grouping. The grouping system utilises the variability present in the different thin sections to classify the samples. Observed variation can be caused by different raw materials, geological variability, technological choices, clay preparations techniques, alteration and preservation issues, and sampling and thin section fabrication. Distinguishing the correct explanation behind the compositional variation can be difficult. Furthermore, describing and dividing the samples is a subjective comparative method that is based in the pattern recognisability in the human eye and brain. Although not objective, this is often the most effective, flexible and adaptive manner to analyse the different samples regarding different questions, materials and matters of scale. Often a first visual distinction is made in low magnification based on a general 'feel' of the thin sections, after which the grouping is revisited in more detail with higher magnification (Quinn 2013, 71-77).

Mostly we are dealing with assemblages rather than singular samples, which allows for a comparative clustering. This grouping or classifying happens in petrographic 'fabrics'

which can be considered as recipes that combine multiple aspects which result in a specific combination of inclusions, matrix and void properties. Additionally, there is a matter of scale. Many samples are often related to each other in a certain degree. The assemblage of related groups can form fabric-families, whereas the further division of fabric groups result in sub-fabrics. In addition to these groups, exceptions or outliers are often present (Quinn 2013, 77-78).

The characterisation or description can occur on any scale from the individual thin section to the fabric-families and is a process that describes their visual characteristics as observed under the microscope. Generally, the Whitbread system (1989) derived from soil micromorphology is applied, although the modifications made by Quinn (2013, 79-100) have been applied here as well. First, the parameters for inclusions mainly consist of the:

- relative abundance (using the Abundance Estimation Chart by Terry and Chilingar 1955);
- shape – size – roundness/angularity (using the Characterisatino of argillaceaous inclusions by Whitbread 1986);
- orientation and spacing;
- grain-size distribution (using the Comparative chart for sorting and sorting classes by Pettijohn, Potter and Siever 1972).

Second, the clay matrix is described according to:

- the matrix abundance
- calcareous vs non-calcareous (indicative for the clay source);
- colour range (informs about the firing conditions);
- homogenous vs heterogeneous (reflects natural conditions, cleaning of the clay or clay mixing);
- optical activity by degree of extinction (informs about the firing conditions).

And third, the voids are characterised by:

- porosity (abundance of voids);
- general shape and size (after Stoops 2003);
- frequency and alignment.

Additional techniques can be used to quantify certain elements in the thin sections. This type of quantitative approach is mainly based on the inclusions (Quinn 2013, 102-113). First, the modal analysis investigates the proportion of the inclusions, matrix and voids or the proportion of different type of inclusions. Second, the textural or grain-size analysis focuses on the measurement of inclusion-size. Data for both models are collected by means of point, line, ribbon or area counting, after which the data can be processed

via statistical methods. These quantitative methods are better used in questions concerning technology than provenance.

5.2.1.5 Provenance and technology

Following the analytical phase, the field of ceramic petrography provides valuable methods of interpretation concerning provenance and technology by the detection of patterns in terms of raw material and technology, i.e. where and how were the ceramics made (for base references on how to interpret thin sections of archaeological ceramics, see Peacock 1970; Freestone, Johns and Potter 1982; Rice 1987; Arnold 1988; Quinn 2009; 2013).

The geological provenance of the clay is mainly based on the petrographic composition of the pottery and can indicate the place where it was manufactured. This often differs from the provenience, which is the place where it was (archaeologically) found. Multiple processes of movement from both pots and people have to be taken into account. Geological provenance is defined by Freestone (1995) as the reflection of the geological source area of the ceramics in the mineral and rock inclusions within the paste. However, to derive the actual place of production is more complicated. Ethnographical models (for example Arnold 1988) support the notion of close proximity between the clay source and the place of manufacture, although when the source to workshop distance is larger, such as in non-sedentary or industrial societies, the matter becomes more complex (Peacock 1982a; Stark 2003). That is why the interpretation from ceramic petrography has to be combined with 'macroscopical' elements from the pottery and a geographical patterning of the ceramic assemblages or type. The best conditions to provenance based on the ceramic composition and geological environment connection alone is when the distinctive petrographic characteristics match isolated sources of raw materials. Unfortunately, without this specific connection, it is often impossible to move beyond a local vs non-local distinction. In general, the accuracy depends on the nature of the ceramics, the geology of the study area and the availability of complementary evidence.

The nature of the ceramics entail that coarse pottery has more petrographic indicators than fine pottery for a provenance determination. Additionally, 'exotic' inclusions are easier to establish provenance than common minerals and rocks. For instance, quartz is the most occurring mineral and therefore the least diagnostic. Also, synthetic inclusions and plant temper do not aid the geological provenance much. Furthermore, heterogenic geological areas are optimal for identifying the ceramic's origin, such as mountainous

areas. In contrast, low lying areas with recent sedimentary geology complicates the accuracy (Quinn 2013, 122-129). In all, the geological variety is very important, although this provides us with tools to trace long distance movement of pots and/or people, due to the larger geological variability on a larger scale. Finally, the amount of complementary information is crucial in the provenance interpretation of the clay and production source. The nature of the material culture and the available sources (see 3.2.2) can help the provenance regarding past cultures, craft traditions or known workshops. For the latter the existence of ceramic production evidence, such as kilns, wasters, dumps and tools, can provide a lot of useful comparative material. In addition, this might be found in reference collections or published photomicrographs as well. A final supporting layer of information can be obtained by additional analyses, such as geochemistry.

Reconstructing technological aspects from thin sections is possible, although complex. Whitbread (1995) states that technological studies of archaeological ceramics focus on human interactions with raw materials. This includes the processing of raw materials, the preparation of the clay paste, vessel forming and finishing techniques, and firing. In general, pottery manufacture is a craft tradition and as such is socially embedded. This means that multiple sociocultural indicators are contained within the choices and decisions made by the potter which reflect tradition, believe-systems and express multiple layers of identity (Whitbread 2001). These subtle technological indicators cannot be found in bulk chemical analyses, but rather in the microstructure, texture and composition of the thin section (Quinn 2013, 151). First of all, this means that provenance and technology are interrelated and can provide information assisting a mutual interpretation. For instance, a technological marker can be indicative for a specific source region, tied to a cultural tradition of certain people. Also, the source region can be influential in the construction of functional or symbolic choices, mainly caused by the presence or absence of specific elements, such as rocks as a coarse tempering agent.

The paradigm of the *chaîne d'opératoire* is very valuable in assessing the processes ranging from raw material acquisition to the object abandonment involved in the life cycle of pottery (Tite 1999). The specific steps involved in the production process of the potter is called a 'technological style'. Mainly evidence for this technological style is derived from the macroscopic characteristics, such as shape and style, although ceramic petrography can add much information. First, the clay choice is reflected in the geological characteristics of the source deposits present in the thin section. When studied in great detail and compared to sources of raw material, micro-provenancing can be obtained

with great accuracy (Quinn 2013, 153-154). Furthermore, the raw material processing displays itself in thin section by evidence of drying, crushing, sieving, levigation and souring. Also, the preparation of the clay can be traced through ceramic petrography, such as the mixing of clays or the presence of temper. Temper can be naturally occurring, but in that case has to be viewed as a part of the raw material, which mainly consists of silt or sand sized particles caused by wind or water transport. Actual intentionally added aplastic inclusions as temper can either be functional or symbolical. A functional temper consists of elements added to obtain a desired specific effect, such as enhanced workability, toughness, thermal shock resistance or porosity (Hein, et al. 2008). A non-functional temper is usually abundantly present, given that it expresses a certain message (Day 1989). Additionally, the forming process can leave traces that can be observed in thin sections on a microstructural level. This is mainly visible through the orientation of the inclusions, voids or clay. For instance, a wheel thrown pot will show much great alignment than a coil build put, which will display a circular pattern. The finishing techniques are usually less present, given that the sampled area of the pot plays an important role here. Though, most techniques are quite easily discerned in thin section, such as painting, slipping and glazing (Quinn 2013, 174-185). Contrastingly, the firing conditions are discernible in every sample. The estimated degree of firing can be deduced from the optimal activity, mineral alterations and potential bloating pores. Also, the firing atmosphere is indicated by the colour of the matrix, pointing to variations of reduced and oxidised firing techniques. The combination of these two factors provides a suggestion to type of kiln as well, and inform us on the potential scale and professionalism of the potter and/or workshop. Finally, information concerning the vessel use is very limited in petrographic studies, with the exception of crucibles with slag deposit (Quinn 2013, 188-204).

In conclusion, it suffices to say that ceramic petrography has great potential as an analytical technique to trace provenance and reconstruct technologies. Combined with other techniques and disciplines, it also aids us in investigating economical processes tied to specific classes of ceramics as well as exploring sociocultural dynamics expressed in the pottery.

5.2.2 Handheld XRF

X-ray fluorescence has become a widely applied analytical technique favoured by archaeologists and art historians in order to discover the chemical composition of artefacts or works of art (Janssens, et al. 2000; Milazzo 2004; Frahm and Doonan 2013).

Especially portable and handheld XRF spectroscopy is interesting for archaeology and art history given its non-destructive nature, its capacity to analyse *in situ* and short analysis time (Potts and West 2008; De Langhe 2015). Additionally, for the handheld XRF (hXRF), no elaborate sample preparation is necessary. The sample merely has to be optimally positioned relative to the hXRF device. Among the main limitations are its incapability to register low energy fluorescence X-rays and thus, generally, cannot give information on elements around and below aluminium (Al) and silicium (Si). Additionally, the hXRF is a surface analysis for which the penetration depth for some materials can be problematic (Potts and West 2008, 4-5). Nevertheless, this technique is a valuable tool to identify the composition of artefacts which can be used to investigate matters of production, consumption and technology in general.

5.2.2.1 X-ray fluorescence (XRF)

X-ray fluorescence uses the characteristic energy signal of a specific element to identify the chemical composition of a sample. Pollard et al (2007, 101) defines the XRF principle as follows:

> 'Primary X-rays are incident upon a sample and create inner shell vacancies. These vacancies de-excite by the production of a secondary – fluorescent – X-ray whose energy is characteristic of the elements present in the sample.'

Basically, an X-ray source creates an interaction of the elements in the sample with the X-rays causing inner shell vacancies or hole when an electron is removed from the atomic structure. This is an unstable situation that results in the internal rearrangement of the electron structure, by which an electron from a higher shell drops down to fill the vacancy. The energy difference between these two levels is emitted as secondary X-rays with an energy specific to that element, which is registered by the detector. These secondary (fluorescent) X-rays are counted and their energy levels measured, resulting in the identification and quantification of the elements present in the sample (Pollard 2007, 93-95; De Langhe 2015, 10).

These measured energy levels are graphically represented in a characteristic X-ray spectrum where the wavelengths of the X-rays are dependent on the elements atomic number (Z). The measured intensities of the elements present in the sample are represented as elemental peaks: the height of the peak corresponds to the count of secondary X-rays and indicates the concentration of each element within the sample (De Langhe 2015, 12-14). Additional peaks can obscure the identification of the composition of the sample (such as sum peaks, escape peaks, diffraction peaks and the process referred to as Rayleigh scattering, for a full explanation see De Langhe 2015, 12-13). Basically, the underlying processes can cause peaks to appear that do not represent the measured secondary X-rays from the sample and complicate the elemental identification.

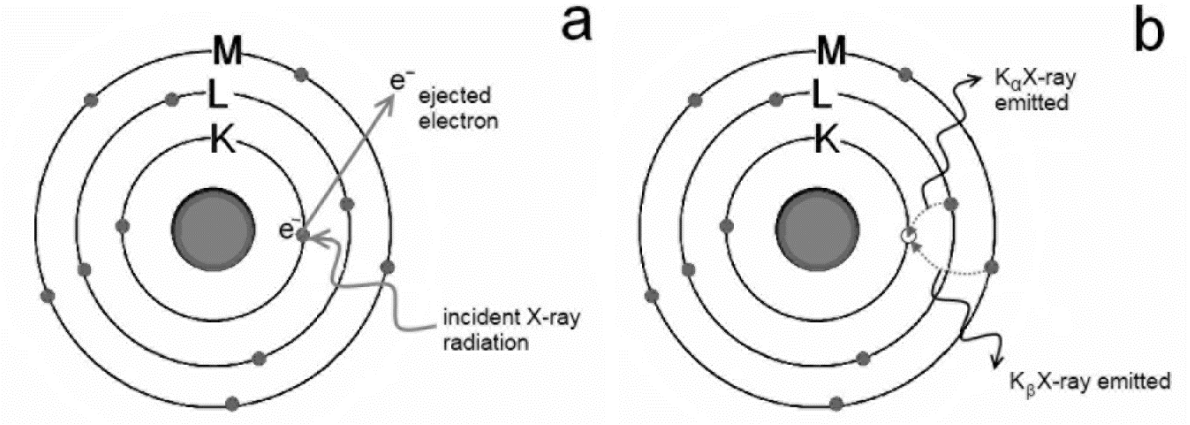


Figure 54 Representation of the XRF principle on Bohr's atomic model: characteristic X-rays are emitted when a vacancy in the inner shell is filled by an electron from the outer shell after an electron from the inner shell is ejected by the interaction with the incident X-ray (after Elia 2013, 66, fig. 2.10).

5.2.2.2 Handheld XRF and archaeology

Portable and handheld XRF have become widely applied in archaeology and have stirred up quite a debate on the applicability, validity and reliability of archaeologists 'running around' with XRF devices (Frahm and Doonan 2013). The main scepticism has centred around the analytical performance in which the established laboratory protocol is ignored (Shennan 2010). As is shown from the recent literature survey on 200 papers by Frahm and Doonan (2013), this statement appears to be incorrect, given that approximately two-thirds of hXRF analyses are located in laboratories, museums and archive facilities. The main field application is used rather in environmental testing and earth sciences, than in archaeology or art history. Despite the low cost-time expense, the hXRF has not yet found its way to commercial archaeology for field applications. The

literature survey revealed that on site analyses in museums and standing heritage such as churches is the main motivator for choosing the hXRF device in archaeology, approximately in 40% of the cases. In the other 60%, preference is given to other portable or laboratory XRF devices. The subject of these hXRF studies is often aimed at evaluating the instruments performance and compatibility with other techniques. In this case, archaeological artefacts are used as test-objects in the same way that experimental materials would be used. This results from a strong lab-orientated approach, which has made archaeology follow their analytical perspectives on method, theory and research goals. Mainly, this enforces the validity of the results procured by hXRF analyses, often through close collaboration with experienced analysts and counteracts the scepticism mentioned above. However, the development of new archaeological methods and questions deriving from the increase in hXRF application has yet to happen. The authors of the elaborate literature survey stated that hXRF has the potential to become widely used in artefact processing as a method to document large numbers of recovered objects, during the excavations and after. Furthermore, they argue that *in situ* applications can be valuable to investigate patterns of space, context and material culture and accommodate new ways of chemical data collection, for example in the case of craft production or household organisation. In its turn, this could result in the re-evaluation of current methods and knowledge and spark new methodological and theoretical discussions.

Speakman and Shackley (2013) responded on the article by Frahm and Doonan, arguing from a more analytical point of view. Their major issue with the aforementioned vision on pXRF in archaeology consists of the lack of external verification caused by results that are only internally consistent and do not conform to the established standards and data (Speakman and Shackley 2013). They argue that most archaeologists lack experience in the basic science behind X-ray physics, analytical chemistry of provenance studies, creating a 'black box' perspective. In order to avoid this 'poor science' it is necessary to provide results that can be compared and evaluated by an independent subsequent experiment. A number of approaches are listed to deal with these issues (see Speakman and Shackley 2013, 1437-1439), contributing to the future applicability of pXRF for archaeological purposes.

The on-going debate on the applicability and approaches of hXRF marks the conflicting interests from the analytical and archaeological studies. The analytical part is rightfully concerned with validity and reliability of the results, whereas archaeology often uses these techniques and results without understanding the limitations and procurements

necessary to apply these methods correctly. Often, analytical techniques are used as a 'magical' answer to difficult questions. This, however, is not in the interest of archaeological science or the field of archaeology in general. On the other hand, it also has to be mentioned that analysts often lack the knowledge to make a meaningful interpretation of the data generated by analytical techniques to contribute to the archaeological debate or historical narrative. The collaboration between disciplines is necessary, though not always easy. The emergence of archaeometry has been ameliorating this gap, creating researchers in both archaeology orientated on history and social science, as well as educating them in scientific disciplines and methods.

These arguments are also valid for the application of other archaeological sciences such as the ceramic petrography, discussed above. To ensure that the proper knowledge concerning the specific application of XRF analyses in this study, the following section will elaborate briefly on the circumstances and limitations that occur with hXRF analyses of copper alloy objects, as studied in chapter 8.

5.2.2.3 Surface analysis on copper alloys

Despite the great applicability of hXRF, some limitations exist concerning its use for analysing irregularly shaped and corroded metal objects, such as the brooches studied here (chapter 8). Archaeologists, art historians and conservators investigate the physical properties and chemical composition of artefacts. In order to allocate objects to a specific (pre)historic context and to determine the correctness of the presumed provenance or manufacturing technology (Mantler and Schreiner 2000), handheld XRF is often used. Its non-destructive nature and little need for sample preparation have made it a desirable technique. However, an insufficient knowledge of the limitations provided by surface hXRF, can obscure the results and cause incorrect interpretations.

An important factor is the penetration depth: the X-rays penetrating a sample are absorbed along its path (Mantler and Schreiner 2000). The secondary radiation that emits from the sample, is subject to the composition and the thickness of the sample. On homogeneous objects, this is of little consequence, but with heterogenic compositional artefacts, this can bias the results. For instance, on copper alloys containing a patina with a large thickness (more than several µm), the resulting measurement of the corroded surface, i.e. the patina, can differ quite drastically from the actual bulk composition (Milazzo 2004). Additionally, an irregular shape can also generate a skewed image, due to the over- or under-radiating of certain parts of the sample. These two aspects, combined

with the limited detection capacity of the low Z elements, have generated the opinion that only semi-quantitative analyses are possible in hXRF applications for certain types of materials.

For these reasons, a similar approach as applied by Martinón-Torres et al (2012; 2014) was followed. Here, factors such as corrosion, uneven surfaces, surface coating and contamination by soil deposition has been taken into account. These factors can cause deviating results from the actual bulk composition of the artefacts and when the surface of these objects are analysed without prior abrasion, the results cannot be considered fully quantitative measures of the overall composition (Martinón-Torres et al 2012, 544-545). In this kind of 'semi-quantitative' studies, the general focus is placed on the overarching trends, rather than to focus on the composition of each individual object. In order to do this, multiple archaeological aspects such as spatial distribution and chronology have to be taken into account when interpreting the chemical data.

The specific limitations on analysing copper-alloy objects by means of hXRF are mainly comprised of corrosion and soil contamination, although the inherent nature of copper alloys can already obscure the analytical results. Various degrees of copper alloys exist in order to create objects with desirable mechanical, physical and chemical properties (Elia 2013, 17), of which the most frequent alloys found in archaeological assemblages are: arsenical copper (Cu + As), copper antimony (Cu + Sb), bronze which is copper mixed with tin (Cu + Sn), and brass which consists of copper with zinc (Cu + Zn). Additional elements can be part of the alloy as impurities to the original ore (such as nickel (Ni) and iron (Fe)) or can be intentionally added to improve the workability and casting process, such as lead (Pb). In this case, the label of ternary alloys can be used, mainly indicating leaded bronze (Cu + Sn + Pb) or leaded brass (Cu + Zn + Pb). Another ternary alloy goes by the name of gunmetal and is usually the result of the mixing of bronze and brass (Cu + Sn + Zn). Furthermore, quaternary alloys also often occur in the archaeological record, which is caused by the mixing of leaded copper alloys (Cu + Sn + Zn + Pb) (Elia 2013, 17-20).

This means that the copper alloy of the artefact itself, can already explain potential inaccurate identifications. For instance to produce brass, the process of cementation is often used. This process, basically, involves melting zinc to the point where it evaporates in order to have zinc-vapours that diffuse in the metallic copper. The repetition of this process in the recycling of metals can cause the loss of zinc (Elia 2013, 20-21). This indicates that potentially the production of a (recycled) brass was attempted, but does not register as such to modern classifications, considering the low amount of zinc

remaining after repeated re-melting. A second aspect that can cause deviating measurements, is the forming of lead globules in copper alloys, due to insufficient solution. This might result in a strong or weak lead energy signal from different parts of the same sample.

These discrepancies can easily be countered by multiple measurements on the same sample and an adept knowledge of the accepted range of variability for a specific alloy. Corrosion, however, is not as easily countered. Corrosion is the natural degradation of metal and is an electrochemical process involving the exchange of ion, mainly causing the dissolution or removal of alloy components (Elia 2013, 22). The corrosive behaviour of a metal is correlated with the composition of the alloy. In a low corrosion environment, bronze undergoes a de-cuprification of the surface, i.e. the selective removal of copper, resulting in a tin-enriched surface layer. In an aggressive corrosion environment, bronze is subjected to a progressive dissolution of copper, causing a tin-rich inner layer and a copper-rich exterior layer. The process for brasses is similar in which the process of dezincification marks the selected removal of zinc from the core, leaving a zinc-enriched surface. A de-cuprification can also occur in brasses. A typical corrosion of leaded cupper alloys is called 'Galvanic' corrosion in which lead is oxidised first, leading to the formation of cracks and fractures in the corroded areas of the sample (Elia 2013, 27-28). Without the removal of the corrosion, it becomes difficult to identify the exact composition of the sample.

Additionally, the contamination of the soil can add elements to the spectrum, although often these can be separated quite easily, with exceptions of metal-rich environments containing elements such as iron (Fe).

Finally, given the absence of a consistent archaeological methodology to examine (Roman) copper alloy objects, related studies have been taken as examples for the processing and interpretation of the chemical results. The main consulted works include, but are not limited to, Pollard et al (2015); Kearns, Martinón-Torres, Rerhen (2010); Bayley and Butcher (2004) and Dungworth (1997). For the sampling strategy and analysis, the standard protocols for analytical chemistry by handheld XRF were followed (see 8.4.1).

In conclusion, the application of the handheld XRF is regarded in this study as optimistic, given that the methodology is sound and tested, both in the analytical chemistry as in archaeological studies, as well as the possibility to compare the results outside the presented study. Combined with other archaeological data, hXRF provides valuable insight in the production process of the metal artefacts, which can be

interpreted in terms of regionality and standardisation, as well as give indications on the technological processes and even assign potential provenances.

5.2.3 Choices of analytical techniques

Three material culture categories were selected to explore social and cultural dynamics present in the Late Roman period for Northern Gaul and the surrounding areas. Social and cultural interpretations from material culture are difficult to comprehend because they often lack direct evidence present in the archaeological record. Nevertheless, by means of archaeological, historical and anthropological models, we can reconstruct sociocultural processes from economic patterns, technological reconstructions or tracing provenance areas. To obtain these more tangible concepts, analytical techniques can provide us with essential information.

The first category is Late Roman handmade pottery, which in macroscopical observation is often hard to distinguish from Iron Age, Early to Mid-Roman and Early medieval handmade pottery. Furthermore, handmade ceramics are often recovered in very fragmented states, depriving us of the shape and style of the ceramic vessel which traditionally informs us on the sociocultural aspect of pottery. Despite these factors, handmade pottery is one of the most frequent artefacts encountered in Late Roman archaeology in the Low Countries. By applying ceramic petrography, it is possible to analyse the composition of the handmade pottery and compare it to the better known earlier Roman handmade pottery from local regions (e.g. Taayke; van Es 1967; Taayke 1990; De Clercq 2009). These previous works provide us with comparable local traditions to trace in the material present in Late Roman times. Not only can we identify continued local traditions, but also non-local elements which indicate movement of pots and/or people. In this case migration (e.g. Germanic people) is a potential explanation (see 2.2) in which ceramic petrography can indicate a potential provenance area. Furthermore, innovations and change present in the Late Roman handmade pottery can inform us on the degree of interaction between different groups of people or communities and help us reconstruct the sociocultural landscape in the Late Roman period for Northern Gaul.

The second case study focuses on Late Roman terra nigra foot-vessels. This type of artefacts are type-fossils for the 4th and 5th century for Northern Gaul, the Lower Rhine frontier and the surrounding part of Free Germania (corresponding to Belgium, the Netherlands, Luxemburg and parts of France and Germany). Despite their value to inform

us on the Late Roman period and the possible transformations of this time, the research on this topic has been very fragmented, resulting in unclear associations. It is unknown if these vessels represent a Roman or Germanic origin, if they are preferred by military, civilian or rural classes, where they were produced and at what scale. Additionally, different typological traditions obscure the relation between shape and fabric. At this point, the ceramic petrography is ideal to investigate this relationship. Not only can a potential typological distinction based on fabric be made, valuable insights on the scale and provenance of its production can be pursued, as well as mapping its distribution which allows us to connect these vessels with the people who owned and used them. In this case study, ceramic petrography is complemented by a parallel study that performed geochemical analyses. Both analytical techniques are invaluable to understand *chaîne d'opératoire* from production to consumption that will help us explore the sociocultural significance of this type of ceramic vessels, which in its turn will aid the exploration of the sociocultural transformations in the Late Roman period.

The final artefact type is the copper alloy crossbow brooch. Its relation to the Roman military and state are well known. Evidence is not only available from archaeological finds, but this brooch type is also studied from an art historical angle. Given their importance, most crossbow brooches reside currently in museum collections or archaeological depots and are not allowed to be damaged or moved from their collection environment. The handheld XRF was selected for its mobile and non-destructive nature, as well as its capacity to reliably detect metal elements (given their high atomic number). The current knowledge of these brooches is mainly based on stylistic and contextual studies, which provided some hypothesis concerning its production and the associated identity of its owners. These assumptions on production can be tested and clarified by examining the brooch composition and relate this to opposing processes of state controlled production, in the form of standardisation, and regionality, expressed in variation. Additionally, the composition can reveal information on potential provenances for the production workshops. Furthermore, by clarifying production and consumption patterns, more insight can be gained into the appropriate identity related to this brooch in a chronological fashion, allowing us to track sociocultural changes in military and state associated classes.

The choices for the applied analytical techniques are a combination of practical choices and desired results in light of the central research question with emphasis on production and consumption patterns of material culture related to matters of

technology and provenance in order to reconstruct social and cultural changes in Northern Gaul for the Late Roman period.

These methods and techniques form the basis of the material culture studies presented in the following three chapters, although occasionally some additional approaches are explored in order to optimise the interpretation of the data set and results. These techniques will be explained briefly in the relevant sections.

6
Traditions and changes in Late Roman Handmade pottery

This chapter examines the first case study concerning handmade pottery from the late 3rd to the 5th century. A general introduction presenting the state of research on Roman handmade pottery is followed by a detailed review of the three previous petrographic studies on Late Roman pottery within Northern Gaul combining samples from Belgium, the Netherlands, Germany and France to provide a comparative framework and supplementation to the current study and dataset. Next, the modifications to the classification system of De Paepe and Van Impe (1991) are explained and motivated. The general objective in this chapter is the characterisation of Late Roman handmade pottery in Northern Gaul and the exploration of their potential to reconstruct aspects of migration, change and continuity.

6.1 Introduction

This part of the chapter aims to deliver an overview of how the study of Late Roman handmade pottery evolved in Flanders. In order to do so, it is necessary to frame the current understanding of Late Roman handmade pottery in the context of Roman archaeology in Flanders. To consider the complete research history of Roman handmade pottery, inside and outside the Roman Empire, is beyond the scope of this overview. First, we will briefly consider the earliest archaeological appearances of handmade pottery for

the entire Roman period in Flanders, followed by the growing interest of this ceramic category, which resulted in the identification of Late Roman handmade vessels and their Germanic association in an ethnic discourse. Additionally, the progression in fabric considerations will be discussed alongside – from colour descriptions over macroscopical to microscopical observations – to frame the relevance of the petrographic history in the current study. Finally, some consideration will be given to the movement away from the ethnic and decline paradigms towards socio-cultural transformation and continuity in a *long durée* approach, from the earlier Roman period into the Late Roman and Early Medieval period. This development resulted in the appreciation of handmade ceramics as a significant ware in its own right, both to investigate indigenous and local cultural transformations as well as to explore the immigration of people.

6.1.1 The development of Roman handmade pottery in the Flemish archaeological tradition

The earliest archaeological observations of Roman handmade pottery in Flanders took place between 1950 and 1970. Back then, the Roman research was mainly led by archaeologists, such as De Laet, Mertens, Thoen, Roosens and Vanvinckenroye to name but a few. Their interests consisted mainly of military and civilian settlements, structures, graves and coins. In this early period of Gallo-Roman research, there was little to no distinction in (Late) Roman handmade pottery. When it was not classified as Bronze or Iron Age material, there was only mention of 'pottery from the 4th century', Gallo-Roman pottery or Flemish-Roman ceramics. The handmade vessels were classified as 'normal' or 'common' (coarse) pottery, as illustrated by the study of De Laet and Van Doorselaer (1964) on the finds from a Roman cremation and well in Destelbergen. Moreover, handmade pottery was often considered to be socially and economically inferior to import pottery (e.g. Thoen 1967).

At the same time on sites outside the Roman Empire, handmade pottery took a more prominent place in ceramic analyses of the first five centuries AD, as can be seen in the study of Wijster by Van Es (1967). On these sites, handmade vessels remained the only local technique in pottery production and only a limited amount of Roman import reached these settlements beyond the frontier.

In the 70's and 80's there was a growing interest in imported ware, sometimes resulting in very detailed studies. However, handmade pottery was not considered at the same

level. Although awareness and distinction slowly grew as seen from the study by Goeminne (1970) in which he makes a distinction in the local technique of the 'common ceramics' between handmade and wheel-thrown pottery (catalogue from excavations on the vicus and the 1st century kiln in Wervik). To illustrate, it is noted for certain cooking pots that '*most local examples are made by hand, resulting in a clay coarsely tempered with pebbles, crushed brick, grog and organic material'* (Goeminne 1970, 40).

Furthermore, in the exposition on the local 'industries' from the coastal region, Thoen notes that every day pottery in reduced fabric are mainly manufactured on a turning wheel, although handmade examples occur as well (Thoen 1978, 96). Unfortunately, the interpretation of a deserted coastal plain from settlements after AD 270 became generalised in the Flemish archaeology and had a negative impact on the recognition of Late Roman archaeological features and material culture.

However, in his review of the coastal plain in Roman times, Thoen made some observations of the consumption of Roman handmade pottery over time (Thoen 1987, 74). It was stated that the oldest contexts (e.g. Flavian) contained the most handmade pottery, whereas younger contexts (3rd century) consisted mainly of wheel-thrown pottery. No indications for the Late Roman period were given other than the collapse of the pottery industry. This reinforced the notion that Roman handmade pottery was tied with continued Iron Age traditions in the rural 'less Romanised' areas.

A more thorough distinction in the consumption of handmade pottery came a few years later from the regional study for the Lys-Scheldt area by Vermeulen (1992). He presented an overview of the handmade pottery for the area, in which he expressed his surprise on the quantities and significance of this ceramic group (Vermeulen 1992, 103-113): a 80-90% dominance of handmade pottery was observed up to the Flavian period, after which the numbers gradually diminished to about 40% for the late 2nd and first half of the 3rd century. Additionally, Vermeulen was the first to note the possibility of imported handmade pottery, i.e. moving pots instead of moving people. Furthermore, a separate section deals with the Late Roman and Early Medieval handmade pottery of the 4th and 5th century from Asper, Sint-Martens-Latem and Kruishoutem, to which a general 'Germanic' label is assigned (Vermeulen 1992, 114-116). Based on decorative and petrographic features, the 4th century ceramics from Asper and Sint-Martens-Latem were connected with migrants from across the Rhine (Franks) and the North Sea (Anglo-Saxon). Whereas the 5th century pottery from Kruishoutem is seen as the predecessor of the later Merovingian pottery. The additional question of the relation with the 3rd century

traditional handmade pottery is posed and opened up a narrative involving local continuity alongside the migration interpretation.

The transition of the 20th century to the 21st saw a large increase in sites and material culture caused by the rescue excavations. This development in the Flemish archaeology marked a time with a new generation of archaeologists that sought alternative methodologies and perceptions towards handmade pottery as a ceramic group in its own right. Studies such as De Clercq on Bachte-Maria-Leerne and Merendree (1997; 1998) and Hollevoet on Sint-Gillis-Waas, Roksem, Zerkegem and Varsenare (1990; 1994a; 1998) brought the lack of evidence for the Late Roman to early Medieval period to light and evaluated handmade pottery in the same manner as imported wares.

Furthermore, with evidence of 'Frisian' handmade ceramics in Zele, De Clercq and Taayke (2004) pointed out that it is also possible that Germanic pottery can be placed earlier in the 3rd century and that Germanic incursions or migrations are not restricted to the Late Roman period (De Clercq and Van Dierendonck 2006, 66-68). This notion was also confirmed by the 'Germanic' handmade pottery from Kontich (De Paepe and Van Impe 1991) and Elewijt (Van Impe, et al. 2005) dating to the 3rd century.

More recently, following the advent of commercial archaeology in Flanders, the largest study of Roman handmade pottery yet was made by De Clercq (2009). In this study he sought for a greater understanding of the transformations of the indigenous cultural traditions in the North-Menapian area. The handmade pottery category is elevated to an integrated study that combines precise documentation and description on the sherd and fabric level and interpreting the results in a socio-economical, technological and cultural framework (De Clercq 2009, 397-402). This approach adopts the principle of the *chain opératoire* by which a number of style-groups were created. These are defined as contemporary pottery assemblages with more or less the same characteristics (following Van Heeringen 1989, 189), based on precise analyses of the form, temper and decorative patterns. This method moved away from the ethnic discourse by using the North-Menapian handmade ceramics as a geographical and chronological label encompassing all handmade pottery style-groups (De Clercq 2009, 422).

Despite the focus on mainly the 1st century BC to the 3rd century AD, the quantity of data allow us to use this study to make a connection between the 3rd and the 4th century. Furthermore, the methodology is valid and has been adopted in the current study (see further).

6.1.2 Studies on Late Roman handmade pottery

As already indicated above, the last two decades of the 20th century was a noticeable increase in attention towards Late Roman handmade pottery resulting from large-scale excavations uncovering 'Germanic' settlements and 4th century material culture. After viewing the Germanic presence solely as barbaric incursions for decades, renewed (micro-regional) interest was found attempting to understand these Germanic settlers in the 4th and 5th century. The most prominent sites include Donk (excavations 1977-1982; Van Impe 1980; 1981; 1982; 1983; 1984) from which the handmade pottery was closely examined; Neerharen-Rekem (excavations 1978-1985; De Boe 1981; 1982; 1983; 1985; 1986; 1987) from which unfortunately the details on the handmade pottery were not published; the sites of Kruishoutem (excavations 1970-1995) also lacking published details on the handmade pottery (Vermeulen, Rogge and Van Durme 1993, 172-174); Asper (excavations 1976-1985) with some details provided (Vermeulen 1986, 112-114); and Sint-Martens-Latem (excavations 1978-1988) which is the best documented site. A detailed investigation was carried out for the 1st to 3rd century handmade pottery (Vermeulen 1989, 64-67) and followed by an exploration of the Late Roman examples (Vermeulen 1989, 73-76). Furthermore, samples from Asper and Sint-Martens-Latem were included in the petrographic study of De Paepe and Van Impe (1991).

Around the same time, Rogge and Van Doorselaer (1990) saw the necessity for a review of the handmade pottery from the Late Roman and the 'Migration' period (4th - 6th century) in the coastal area and the Scheldt valley. A summary of sites is followed by a 'decline approach' related to the first phase of 'Germanic colonisation' of the area in the 4th and first half of the 5th century. The given arguments consist of the resurgence of timber constructions and material culture that can be found north of the Rhine. Among this material culture, they observed pottery that differentiated from the Gallo-Roman tradition. Based on macroscopic observations, they noted four different techniques:

1. high fired with fine sandy clay;
2. medium to high fired tempered with coarse rounded to angular quartz grains;
3. grass-tempered ware which contains abundant plant material;
4. medium to low fired tempered with ceramic building material or oxidised clay pellets, from which occasionally a variant with coarse quartz grains was found as well.

Moreover, for the Late Roman phase, they connected a sherd from Zerkegem with a chevron decoration to Anglo-Saxon pottery and established a link with the *Schalenurne* culture from Holstein by the presence of foot-vessels and a decorative motif of clustered diagonal lines. Although highly coloured by the concept of Germanisation, they presented a first transformation narrative bridging the Roman and Early Medieval period creating the idea of cultural change and continuity from the 3rd century towards the Merovingian and Carolingian period.

The base for the current study was mainly set by the petrographic study into Late-Roman 'Germanic' handmade pottery by De Paepe and Van Impe (1991). This was the first large-scale interregional study focussing directly on the composition of the fabrics. By comparing ceramics from Belgium, the Netherlands and northwest Germany, they were able to make a distinction between five major groups and split one group into five separate subgroups. By means of spatial distribution of the fabrics and the geological indicators, source areas were suggested for certain pottery groups, while others remained rather obscure in provenance (see 6.1.4.1). Furthermore, the historical and archaeological contextualisation contributed much to the migration debate and the nature of the Late Roman settlements.

Following these studies, and coinciding with an interest in the origin and evolution of the 'linguistic frontier' in Belgium (i.e. the division between the Dutch and French speaking parts), arose an overview for the entire Roman period for northern Gaul by Lamarcq and Rogge (1996). This book incorporated the archaeological material in a historic narrative, which remained very Germanic-orientated for the Late Roman period. Without exception, the handmade pottery is seen as Germanic pottery from across the Rhine, claiming that it has nothing in common with indigenous Roman pottery regarding form, decoration and fabric. Moreover, it was regarded as pottery that strongly resembles prehistoric pottery (Lamarcq, Rogge 1996 123). Despite their knowledge of the petrographic study of De Paepe and Van Impe, they only focussed on the 'exotic' relation of the handmade ceramics with the areas in the northern Netherlands and Germany and neglected to mention the discovery of the large portion of Late Roman handmade pottery made from local clays (Lamarcq, Rogge 1996, 133).

The ethnic approach, however, was not yet completely abandoned, as illustrated by the ‘Frankenproject’ by Opsteyn (Taayke, Opsteyn and Bouwmeester 1998; Opsteyn 2003). Although, a more nuanced view was adapted and it was recognised that the

archaeological reality was more complex than a mere replacement of the indigenous Gallo-Roman population with Frankish immigrants.

Finally, the recognition of Late Roman material culture in the commercial archaeology in Flanders is currently improving by the better understanding of Late Roman house plans, often associated with areas north of the Rhine, such as the Wijster-house types. Usually, the handmade pottery is evaluated in the excavation report, of which the extent and details vary depending on a range of circumstances which have a (negative) influence on the processing of material culture in commercial archaeology. Some new excavations with Late Roman handmade pottery are represented in the current study, such as Meldert-Zelemsebaan, Hasselt-Rode Rokstraat and Nazareth-Eke. These sites will be elaborated upon in the appropriate sections below.

6.1.3 Previous petrographic analyses on Roman Handmade pottery

Before elaborating on the comparative framework comprising of petrographic studies on Late Roman handmade pottery, we will briefly visit upon the application and development of petrographic analyses on Roman handmade pottery from Flanders in general.

The first reference to the mineralogical composition and tempering agents can be found already in 1966, when De Paepe provided a first characterisation of clays for local Roman ceramics from the Waasland area (Thoen 1966). Although focussing on the introduction of the wheel-throwing technique and professional kilns, it was noted that the same local Rupelian clay was used as before (i.e. Iron Age). Characteristics of the clay in the fabrics were described as '*of poor mineralogical composition with very little feldspar (microcline and plagioclase) and mica (muscovite) in comparison to quartz (mostly small grains)*' (Thoen 1966, 100-101).

The following petrographic observation appeared in the exposition on the local 'industries' from the coastal region (Thoen 1987). A full mineralogical evaluation was made by De Paepe on the common pottery presented in this volume. Here Thoen made the observations that although the common pottery in a reduced fabric are mainly manufactured on a turning wheel, handmade examples did occur as well (Thoen 1978, 96). Additional interest was taken into the fabric composition of the ceramics and the clays that led to the petrographic analyses of the pottery. The mineralogical report

concluded that the main temper consisted of chert and calcite, indicating crushed limestone (Thoen 1978, 207-209).

The aforementioned methodological change at the end of the 20th century inspired by the increase in number of excavations, was visible from changes in research goals. In this case, it marks the use of ceramic petrography to understand provenance and technology in relation to larger historical narratives, such as the migrations from the 4th to the 6th century. First, De Paepe made the interregional petrographic study on Late Roman handmade ceramics together with Van Impe in search for the provenance of the 'Germanic' pottery (Van Impe and De Paepe 1991). This study will be discussed in greater detail throughout this chapter.

Second, a selection of handmade sherds were analysed by De Paepe-Mestdagh in order to uncover the provenance and function of the vessels from Sint-Gillis-Waas (Hollevoet and Van Roeyen 1992, 213-216). Additionally, Hollevoet sought mineralogical and technological similarities for the early Medieval chaff-tempered pottery from Roksem by comparison with English samples in order to confirm or rebut their 'Saxon' nature (Hamerow, Hollevoet and Vince 1994a, 11-12).

And the third petrographic study of Roman handmade pottery was performed by Opsteyn and Degryse (Taayke, Opsteyn and Bouwmeester 1998; Opsteyn 2003). Unfortunately, this project was never completed and the results from the handmade pottery and the petrographic analyses were never published. The preliminary results were composed into a report, which has been made available for comparison in this study (Pers. Communication P. Degryse).

These few petrographic studies already indicate that there is a tendency to look at migration through handmade pottery. However, the previous studies derived from an ethnic discourse and focused solely on finding pottery with an exotic provenance. The current changes in mind-set and methodology advises a more cultural perspective to the matter in which non-local material is not immediately linked with an ethnic identity, but carefully contextualised (also see Chapters 2 and 9).

In the following sections we will elaborate on the petrographic analyses and studies that have been performed on Roman handmade pottery that provided a general framework for this chapter.

6.1.4 Comparative petrographic framework

Three petrographic studies have been carried out on Late Roman handmade pottery from Northern Gaul. The earliest and the largest is the interregional comparison of the De Paepe and Van Impe (1991), followed by a study from northern France carried out by Bouquillon, Tuffreau-Libre and Leclaire (1994)(1994). Although, performed separately from each other, they applied a similar inclusion-based methodology, enabling us to compare these two analyses and compare the more recent data with it. Furthermore, these two petrographic studies gained similar insights regarding provenance of the different groups. The third study by Degryse and Opsteyn has unfortunately never been finished or published, however, a preliminary report remains and provides us with the opportunity to expand the comparative data set with more samples from Flanders and the Netherlands. Their approach was also based on the distinctive features set by De Paepe and Van Impe, allowing us to take their preliminary results into consideration.

6.1.4.1 De Paepe – Van Impe

As mentioned in the introduction, the original classification of De Paepe-Van Impe exists of 5 groups based on the presence of significant distinguishable features and the domination of certain inclusions as temper:

Group A: Non-plastics derived mainly from plutonic and metamorphic rocks
Group B: Non-plastics derived mainly from volcanic rocks
Group C: Bone is a major tempering constituent
Group D: Non-plastics derive mainly from sedimentary terrains
Group E: Grog is a major tempering constituent

A more detailed overview of these groups is given in Table 4 and group D has been broken down into 5 subgroups, which are represented in Table 5. These tables are a summary of a complex and varying material intended for a comparison with the new data. For a full mineralogical overview and discussion of these characteristics, please consult the original study of De Paepe and Van Impe (1991).

Table 4 Representation of the main characteristic of the main group classification system of De Paepe and Van Impe (1991).

	A	B	C	D	E
Characteristic	Plutonic and metamorphic rocks	Volcanic rocks	Bone	Sedimentary origin	Grog
Matrix grain size	Silt to fine sand	Coars-very coarse sand		Silt to sand	Silt
Major mineralogical constituents	quartz, alkali feldspar, plagioclase, hornblende, biotite, muscovite, iron ore	quartz, augite, iron ore	quartz, glauconite	monocrystalline quartz	Quartz
Minor mineralogical constituents	zircon, garnet, chlorite	orthoclase, muscovite, plagioclase, tourmaline, hornblende, zircon, zeolites	iron ore, plagioclase, microcline, muscovite, tourmaline, zircon	*see subgroups*	Muscovite, biotite, plagioclase, orthoclase, microcline
lithic inclusions	granite, granodiorite, gneiss, amphibolite, quartzite	volcanic detritus, chert, sandstone	chert, sandstone, granitic detritus	sandstone, limestone	Absent
Added temper	No or few grog		Bone		Grog (av. 1-1.5 mm)
Organic component	charred plant remains and other organic matter (shells, bone) occurs	poor in carbonised plant material	minor amounts of carbonised plant matter	*see subgroups*	Vegetal matter and bone
Main distribution of sample population	Germany	The Netherlands and Belgium	Belgium	The Netherlands and Belgium	The Netherlands
Potential source area of the mineralogical profile	Glacial deposits from the Netherlands and northern Germany	Quaternary Eifel volcanic area in Germany	Tertiary clays of Low and Middle Belgium	Undetermined	Undetermined

Table 5 Representation of the main characteristics of the Group D division from the classification system of De Paepe and Van Impe (1991).

	D1	D2	D3	D4	D5
Average grain size	Silt and very fine sand	Sand		Silt and very fine sand	Sand
Major mineralogical constituents	Monocrystalline quartz and coarse alkali feldspars and polycrystalline quartz	Quartz, glauconite	Debris of calcerous rocks and biogenic skeletal matter composed of carbonates, quartz, glauconite	Quartz, iron ore	Monocrystalline quartz
Minor mineralogical constituents (one or several)	Plagioclase, muscovite, biotite, tourmaline, glauconite, epidote, iron ore, garnet	Orthoclase, microcline, plagioclase, muscovite, biotite, iron ore, tourmaline, zircon	Muscovite, biotite, iron ore, plagioclase, microcline	Plagioclase, microcline, orthoclase, muscovite, hornblend, chalcedony	Muscovite, biotite, hornblende, iron ore, alkali feldspars, plagioclase, glauconite, zircon, garnet, tourmaline
Lithic inclusions	Coarse-grained sandstone, chert, alkali granite	Chert, sandstone, hollocrystalline lava of basic composition	Limestone		Ferruginous sandstone
Organic component	Vegetal and bone	Varies from excess to absent	Shell fragments	Carbonised plant matter	Vegetal and bone

In total, 169 handmade sherds from Belgium, the Netherlands and northwest Germany from the 4th century were submitted to petrographic analyses. The main aim consisted of placing the 'Germanic' pottery found in Donk in a wider historical and archaeological context in order to understand the migrations and their effect on the Belgian sites.

The general distribution for these groups gave a first indication towards the provenance and spread of the different handmade ceramics (see Table 6). Group A appears in major numbers on the German sites, frequently in the Belgian samples and only occurs sporadic in the Dutch samples. Donk has the largest number of samples for Belgium, and Virton, Kontich, Sint-Martens-Latem and Asper contain only one specimen. Dalfsen and Oud-Leusden are the only Dutch sites with both 2 samples. Group B is very small, with only one sample in Virton (BE) and one in Ede-Veldhuizen (NL). Similar, Group C has very few numbers, only found on the Belgian sites of Donk and Sint-Martens-Latem. In contrast, Group D has the highest number of samples for samples from the Low Countries, occurring on all sites but one: Donk, Liberchies, Virton, Kontich, Sint-Martens-Latem, Asper, Dalfsen, Colmschate, Oud-Leusden, Ede-Veldhuizen and Bennekom. Despite the large amount of sherds identified as Group D, no German sherds were added to this

group. The final Group E is again very limited, appearing only in the samples from Donk, Ede-Veldhuizen and Bennekom (De Paepe, Van Impe 1991, 164-165).

To narrow down the potential source areas for these ceramics, the geological indications from the mineralogy and rock inclusions were used. Group A contains plutonic and metamorphic derivatives, which are non-indigenous for the Low Countries. The most evident relation was sought in glacial deposits, occurring in the northern Netherlands and Germany. Similarly, Group B contains non-indigenous volcanic rocks, for which the most likely provenance was determined to be in the Eifel region. Although the quaternary fluvial deposits in the Netherlands and certain areas in eastern and southern Belgium were acknowledged as potential candidates as well. The low number of samples was seen as a support for a source area outside of Belgium or the southern Netherlands. In contrast, Group C was determined to be a very limited regional distribution. It was noted that by microscopic analyses alone, this ware cannot be differentiated from the Neolithic bone-tempered ware from the Hainaut province and eastern Belgium. Furthermore, Group D was considered to consist of very localised productions, probably on site. Additionally, for Group D3 containing shells, it was stated that the source-to-site distance would be very limited. Finally, Group E could not be given a potential provenance, mainly due to the absence of lithic inclusions and not enough samples to look for a mineralogical pattern (De Paepe, Van Impe 1991, 167-168).

The handmade ceramics containing non-indigenous sources for the Belgian area were interpreted to arrive either by trade or as part of the belongings of a migrant family. It was noted that the historical record supports the latter. Furthermore, it was observed that the sherds catalogued by typological analyses as 'Germanic' were manufactured from Group D variations, i.e. from local sedimentary clays. The explanation for this phenomena given is the replacement of the original migrant household pottery by reproducing the traditional pots with local clays, suggesting that the new settlers remained long enough to thoroughly explore the landscape. Additionally, a chronological observation was made by the sherd from Kontich (BE). It was identified as Group A, confirming the presence of Germanic people in the area in the 3rd century. By this example, they tried to call for caution and careful consideration of every 'Germanic' pottery in their own archaeological context (De Paepe, Van Impe 1991, 168-171).

Table 6 After De Paepe and Van Impe (1991): number of samples and different sites per group.

		Belgium		the Netherlands		BE-NL	
Group	**Class**	samples	sites	samples	sites	samples	sites
A	P + M	10	5	4	2	14	7
B	V	1	1	1	1	2	2
C	B	3	2	0	0	3	2
D	S	27	5	34	5	61	10
E	G	1	1	8	2	9	3
	total	*42*	*6*	*47*	*5*	*89*	*11*

6.1.4.2 Bouquillon – Tuffreau-Libre – Leclaire

From the same time as the study of De Paepe-Van Impe, an additional comparative petrographic research on handmade pottery from the 4th and 5th century was done in Pas-du-Calais, northern France. Around the same time as in Belgium, they noticed a significant presence of handmade ceramics in Late Roman assemblages, associated with other 'late Gallo-Roman pottery'. Similar problems arose in collecting quality samples, such as difficulties in distinguishing this material from Iron Age or early Roman material. The forms and fabrics looked very similar with a grey to black colour, smooth and polished surfaces, although the Late Roman ceramics tended to be more highly fired. The range of forms was noted to be limited: only plates, bowls and vessels with a rounded body. Additionally, no large stylistic comparisons could be made, due to little decoration. Parallels with Westphalian material was noticed and the main aims for this study were to discover if these handmade vessels were Germanic products (Bouquillon, Tuffreau-Libre, Leclaire 1994, 225-226).

In total, 50 sherds were collected from 10 different sites: Seclin, Houplin-Arcoisre, Bavay, Arras, Izel les Hameaux, Labuissière, Boulogne, St. Martin Choquel, Nouvion en Ponthieu and Vron. They differentiated the fabrics based on the non-plastic inclusions, such as De Paepe-Van Impe, which allows us to make a comparison in the results of both studies and incorporate the findings here. The distinctive features were: grog (chamotte); coarse rounded quartz-grains; sedimentary, metamorphic or volcanic rocks; shell; and organic matter. The grog is characterised by multiple types of fabrics, sometimes fragments of different fabrics were mixed together as temper in the same sherd. The presence of quartz minerals under 63 µm was attributed to the matrix and quartz inclusions larger than this were noted separately. The lithic inclusions could be divided

in rocks deriving from a sedimentary, metamorphic or volcanic source. The sedimentary source is indigenous to the geology of northern France, whereas a metamorphic or volcanic geology is not. Most volcanic inclusions contained plagioclase, pyroxenes, opaque minerals and to a lesser extent biotite, quartz, olivine and amphibole. The metamorphic inclusions are divers, although most display a medium to high metamorphism and are related to gneiss, metarhyolite and quartzites. The combination of volcanic and metamorphic elements was noted in multiple sherds. Furthermore, the shell inclusions appeared in association with quartz and chert, consistent with a coastal sediment. Finally, the distinction between natural and added temper for the organic matter proved difficult. In all samples, though, the organic inclusions consisted always of plant matter (Bouquillon, Tuffreau-Libre, Leclaire 1994, 227-231).

It was quite clear that the sedimentary derivations and grog-tempered ware could be appointed to a local production(s), since grog temper is also a traditional technique in the region of northern France and this area consists mainly from a sedimentary geology as well. Although, certain specifics from local clay layers, such as the gypsum and pyrite from the Ypresian clay, were not found in the samples. In contrast, the rock elements from volcanic and metamorphic source had to be from another provenance, such as the Central Massive, Germany or Britain. Since multiple ceramics carried Germanic traits and were associated with other material considered Germanic, a source area in Germany seemed likely. The volcanic rocks were fresh, i.e. from recent volcanic massifs, such as the Eifel, Vogelsberg or Rhone area. One comparison was made with rock fragments from the Eifel and a resemblance for the mineral and structural properties were found in basaltic lava. Furthermore, the Mayen or Maares area in the Eifel region were suspected to be good provenance candidates. Additionally, the combination of metamorphic and volcanic rock might be allocated to the Rhine area bordering the Eifel. The sole appearance of metamorphic rocks was less evident, since additional provenance locations can be found in the east of France, the Ardennes or other areas in Germany. These results pointed very convincingly to a Germanic connection. Another feature identified as non-local for northern France are the coarse rounded quartz grains. Their origin remained uncertain, though, the roundness corresponds with a long river transport. Finally, for the shell inclusions was concluded that they could originate from anywhere on the coastal plains of the North Sea (Bouquillon, Tuffreau-Libre, Leclaire 1994, 231-233).

Beside a provenance study, a small chronological comparison was made possible by the sampling of some 1st century handmade sherds and some (early) Medieval sherds. The

number of samples was too few to make a large interpretation, but the local fabric of sedimentary clay with grog proved to be present in the earlier Roman period as well as in the 4th and 5th century. The rocks, however, appeared only in the Late Roman samples and lacked from the few early Medieval sherds. Additionally, no shell temper was found in the 1st century sherds, but was present in the samples from the Late Roman, early Medieval and later periods (Bouquillon, Tuffreau-Libre, Leclaire 1994, 235).

Table 7 French samples presented in the classification system of De Paepe and Van Impe for comparison.

		France	
Group	**Class**	samples	sites
A	P + M	4	2
B	V	4	3
D	S	10	3
D3	Ssh	6	3
D total		16	5
E	G	4	2
	total	28	8

6.1.4.3 Degryse - Opsteyn

These two studies were followed by the unfinished study of Degryse and Opsteyn[12]. They applied the classification of De Paepe-Van Impe and kept the groups mainly intact. The grog tempered Group E (class G), however, was not discussed, due to their suspected local origin. Additionally, they piled subgroups D1/D2 and D4/D5 together, since the difference was found to often be too difficult to distinguish. In total 33 sherds from 23 different sites in Flanders and the Netherlands were submitted to petrographic analyses (by Degryse). Two samples were not taken into consideration, resulting in 31 samples which can serve as a comparison here. The main focus in the preliminary results were an attempt to find markers pointing to a similar production or workshop in order to reconstruct an exchange/import and travel of these ceramics (Degryse and Opsteyn unpublished). The non-local groups A-B (class P-M-V) were found in samples from Ede (NL), Wijk-bij-Duurstede (NL), Voerdaal (NL), Wehl (NL), Aldeneik (NL), Gennep (NL), Merendree (BE),

[12] The data presented here has been made available by means of an unpublished preliminary report. We thank P. Degryse for the permission to use this data.

Zerkegem (BE), Kerkhove (BE) and Achel (BE) (Table 8), and linked to an influence of the Franks, i.e. people north of the Rhine. Group D1/2 illustrated a connection between Gennep (NL), Breda (NL), Voerdaal (NL) and Erps-Kwerps (BE). Group D3 showed a close relation between Aldeneik (Be) and Erps-Kwerps (BE), but appeared different from the sample from Breda (NL). Group D4/5 revealed a correspondence between Breda (NL) and Ede (NL). These three groups were considered local productions, given the geological setting for Flanders and the Netherlands. Group C yielded no apparent pattern and was considered as a small localised production on each site. A final note from this brief evaluation, is that the macroscopic groups do not match the petrographic results. An explanation was sought in the poor state of the ceramics and the abundance of quartz in all groups.

These preliminary findings are in correspondence with the results from De Paepe-Van Impe, supporting the claim that Group A and B are not local for the region of Flanders and the southern Netherlands.

Table 8 After Degryse-Opsteyn: number of samples and different sites per group.

		Belgium		the Netherlands		BE-NL	
Group	**Class**	samples	sites	samples	sites	samples	sites
A	P + M	2	2	3	3	5	5
B	V	4	4	5	3	9	7
C	B	0	0	4	3	4	3
D1/2	S	4	1	3	3	7	4
D3	Ssh	3	3	0	0	3	3
D4/5	S	1	1	2	2	3	3
D total		8	4	5	4	13	8
	total	*14*	*10*	*17*	*13*	*31*	*23*

6.1.5 Objectives

The first general objective of the study on the Late Roman Handmade pottery (LRHM) is to identify the larger trends in the handmade pottery for the Late Roman period (AD 270-450) in northern Gaul, by using the area of modern day Flanders as a case study and the surrounding regions as a comparative framework. In no way is this study meant to be understood as an exhaustive study of all handmade pottery occurring in the study area

of the Low Countries in the 3rd, 4th and 5th century AD. This effort would be tedious and ineffective, for as De Clercq (2009, 411) noted in his research:

> 'It is necessary to have at least 50 sites per century to acquire reliable data and models for techno-typological characterisation per (micro) region.'

Due to insufficient reliable findings from good contexts with secure dates, this is simply not possible for the Late Roman era in the Low Countries. So by carefully selecting a wide range of samples, both in the spatial and chronological sense, it's the intend of this study to create an overview of the varying possibilities characterising the Late Roman handmade pottery in northern Gaul. In such, the classification also has been designed to allow for future additions when more material becomes available and not to make a strict categorical typology. The specific goal of the case study on the handmade ceramics from Flanders is to investigate trends in composition and technique and link these elements to larger questions concerning mobility, migration and socio-economic processes in the Late Roman period in northern Gaul.

6.2 Methodology

6.2.1 Sample selection, processing and analyses

All samples are observed macroscopically and documented by describing the fabric by use of an optical microscope (magnifications x10, x20, x40) on a fresh break of the potsherd. A thin section – a 0.03 mm thick slice on a glass plate – was made from every sherd and analysed by polarized microscopy through plain polarised light (PPL) and crossed polars (XP) on magnifications of x10, x20 and x40 to be analysed by techniques from ceramic petrography. At this phase of the research, the petrographic study is orientated towards a characterisation based on the nature of the inclusions, in order to distinguish between possible local and non-local products and to gather evidence for potential source landscapes. In addition to Late Roman Gallo-Roman and 'Germanic' sherds, a selection of 'normal' samples from earlier in the 3rd century were selected also, in order to receive the full spectrum of the material present in these two centuries in this part of northern Gaul and link it with the previous period, enabling us to set a baseline

for what the composition of a 'normal' handmade pot is as well as creating the opportunity to identify a non-local product.

To positively identify a specific source area is more complicated and the determination of the provenance of non-local material will be approached as best as possible in this stage of the research.[13] The distribution of the variation in the handmade ceramics will be investigated, much in a similar way as the impressive study of De Paepe and Van Impe (1991). In this study, a first interregional overview of Late Roman handmade pottery was established for Belgium, the Netherlands and Germany, based on a few well selected sites in three different areas. The focus, however, was mainly to investigate and understand the 'Germanic' material found on some Belgian sites and not to characterise the complete variation of the handmade material present during this time for the entire region. The current research builds on this previous study, by using their results as additional data in the comparative framework and by adopting their methodology for the classification, rather than creating a separate classification. Although, some adjustments had to be made to incorporate the larger variety of fabrics present in the new samples (as will be explained later on).

In total, 91 samples were gathered from Belgian and Dutch sites, respectively 76 sherds from Flanders and 15 sherd from the Netherlands. In addition, the dataset of De Paepe-Van Impe is available for further comparison with samples from Belgium, the Netherlands and northwest Germany. By means of technological and provenance indicators, an attempt will be made to add new information and insights into the debate on the 'Germanic' presence and migration in the Late Roman period for the region of Flanders, as well as evaluate the Late Roman handmade pottery in its own right as a separate and significant pottery group for this period in northern Gaul.

[13] The collaboration with geologist Eric Goemaere is on-going in order to refine the classification and establish potential provenance areas for the ceramics.

Table 9 Sites from which handmade pottery has been analysed.

Country		Site	number of samples
BE	LUM	Lummen - Meldert - Zelemsebaan	11
BE	ZEL	Zele - Kamershoek	3
BE	SML	Sint-Martens-Latem - Brakel - Torenhuis	6
BE	HAS	Hasselt - Kuringen -Rode Rokstraat	8
BE	KNE	Knesselare - Kouter	5
BE	OUD	Oudenburg - Spegelaere	28
BE	MOR	Mortsel - Steenakker	2
BE	TUR	Turnhout - Tijl-en-Nelestraat	5
BE	NAZ	Nazareth - Eke - 's Gravendreef	2
BE	LNR	Lanaken - Neerharen-Rekem	6
NL	TiLM	Tiel - Medel	1
NL	TiP	Tiel - Passewaaij	5
NL	BeL	Beneden Leeuwen - De Ret	1
NL	WEH	Wehl - Hessenveld	2
NL	RES	Ressen/Bemmel - De Kerkenhof	1
NL	HaW	Harlingen - Wijnaldum	2
NL	TyM	Tynaarlo - Midlaren	1
NL	WIJ	Midden-Drenthe - Wijster	1
NL	BRE	Breda - Steenakker	1

6.2.2 Provenance challenges

The basic distinction between 'local' and 'non-local' is not as straightforward as one might think. For the region of the Low Countries the local spectrum is composed from solely a sedimentary source, corresponding with the majority of sedimentary geology in this region. However, local pottery can contain non-indigenous material, which could have been introduced by using 'exotic' lithic material as a temper, complicating the identification of 'local' handmade pottery. In comparison, the indicators of non-local sources are plenty and are as such easier to identify, e.g. inclusions from an igneous or metamorphic origin. Again this cannot be used as a strict rule, for clays with only sedimentary indications can also be found in areas outside the Low Countries. Additionally, igneous and metamorphic inclusions can derive from rocks that arrived on a settlement in another way. For it is known from the stoneless landscape of Flanders that

all kinds of materials and objects were imported for everyday use, such as millstones, whetstones[14] or ballast stones. These objects could have been crushed up after use or discard. This tells us that we have to be careful with allocating these elements directly and uncritically with migration or the mobility of people (see Chapter 2). However, it is also not the intention to deny migration and mobility in total, for this is a historical reality, merely to advocate caution and consider alternative or nuanced interpretations concerning mobility, migration, economic practice, identity and chronology.

6.3 Classification of Late Roman Handmade pottery

The classification method in this study is based on that of De Paepe-Van Impe (1991) and modified to suit the wider variety found in the new samples. To incorporate the reality of large differences within the same groups and the vague boundaries between groups, we have chosen (*Goemaere and Van Thienen*) to abandon the predetermined group labels (A to E) and create a more user-friendly coding system. To clarify, the same distinctive features are still used, only the method in handling and describing them in a system has been altered. Thus it remains the same classification method, only expressed differently.

The recent developments in the increased interest and recognition of (Late) Roman handmade pottery, created a need to elaborate and adjust the existing classification. Group A proved to be too all-enveloping, assigning all plutonic and metamorphic material to one group, which can be traced to the area of northwest Germany. Additionally, in contrast to groups A-B-D, groups C and E are defined by their added temper, rather than by their mineralogical nature. Essentially, this classification duality confronts a researcher with the inability to classify a sherd in specific group when neither the mineralogical inclusions nor the tempering agent are clearly dominant. Resulting from the larger variation encountered and the difficulties with these group boundaries, this classification was adjusted accordingly by E. Goemaere in collaboration with this study.

Before continuing, it is necessary to elaborate on the method and corresponding coding system applied in the current study of Late Roman handmade pottery. Due to the

[14] Ongoing PhD research of S. Reniere (UGent)

richness and varied nature of the material collected here, the focus is placed primarily on the composition of the clay and the inclusions embedded in the fabric. This result in an first insight into the nature of this pottery group, the distribution of their consumption and possibly a better grasp on the nature of the inhabitants of Late Roman northern Gaul. Exploring the more subtle details regarding distinguishing different workshops and tracking production distribution, remains to be studied in a further stage of this research.

In order to comprehensibly handle the varied fabric composition of handmade pottery, a system of devaluating significant properties by letter code is applied. This means that the first letter code stands for the most prominent feature present in the paste, either by its unique distinguishable properties related to a specific source area (e.g. volcanic or plutonic inclusions) or by its dominant quantitative presence (e.g. a predominant quantity of grog). The second letter code refers to the second most significant feature and a third letter code is added when there is a third minor but noteworthy constituent. For example: 'Sq' stands for a fabric where quartz deriving from a sedimentary source is the main constituent. When grog is added as a temper, the code becomes 'Sqg'. If grog appears to be the major constituent of the fabric instead of quartz, the code changes to 'Gq', indicating the dominance of grog and quartz as the most prominent mineralogical element.

By means of this new system, and taking into account the new samples, the former classification of De Paepe-Van Impe has been adjusted to better fit the nature of the material. The former Group A is subdivided into a plutonic class (P) and a metamorphic class (M). The plutonic class is described as fabrics with non-plastics that derive from granitic rocks. The first subclass (P1) is characterised by red feldspar with cuneiform intergrowths, whereas the second subclass (P2) has white feldspar. The latter is more common the former in the newly sampled material and is therefore again subdivided depending on whether it coincides with biotite (P2/1), muscovite (P2/2) or flakes of both mica's (P2/3).

The metamorphic class has been detached from the plutonic group and is characterised by non-plastic inclusion deriving from metamorphic sources. A second division is added by distinguishing between rocks with low grade metamorphism, such as slate or quartzite, and rocks with high grade metamorphism, such as gneiss, schist and amphibolite. These rocks are usually very distinctive in a ceramic thin section and are very valuable for establishing a provenance for the clay.

Table 10 Codes used in the description.

Code	Description
P	Inclusions deriving from a plutonic source
M	Inclusions deriving from a metamorphic source
V	Inclusions deriving from a volcanic source
S	Inclusions deriving from a sedimentary source
g	grog
b	bone
o	slag
pl	plant
sh	shell
q	quartz
fs	feldspar
ca	carbonate
gl	glauconite
mu	muscovite
bi	biotite
am	amphibole
fe	iron
cp	clay pellet

Another distinctive, and usually obvious, class is the volcanic (V), characterised by the presence of non-plastics derived from volcanic rocks. This corresponds quite nicely with Group B from De Paepe-Van Impe, although is subdivided further mainly based on the quantity of the volcanic inclusions in the clay, besides some additional features. A distinction is made between volcanic and siliciclastic rock fragments and minerals, e.g. pyroxene and amphiboles, that cover 25% of the fabric or more in the thin section (V1). The second quantity is fixed on a presence between 5% and 25%, which also often contains limestone inclusions (V2). The third subgroup has small volcanic inclusions, less than 5%. Group D was already divided into 5 subgroups by De Paepe-Van Impe, resulting from the largest presence and large variation of this group in Belgium and the Netherlands, which remains so in the sedimentary class (S). It is necessary to state that the sedimentary class is allocated to fabrics with only non-plastics from sedimentary rocks. If inclusions from a plutonic, metamorphic or volcanic source are encountered in the same thin section, these receive precedence over the sedimentary, for they are more significant in reconstructing

the provenance landscape. Furthermore, it is chosen here not to divide the sedimentary class in subgroups, for the variations are too numerous, and instead characterise them by the coding system. The most frequent chief tempering constituent is quartz, mainly monocrystalline but also sometimes polycrystalline (Sq). This detrital component is occasionally associated with chert, flint, feldspar, lithics such as sandstone and siltstone, and clay. Furthermore, combinations with other major, but less, constituents has been observed as well. Among these, but not limited to, are a mixture of quartz and feldspar (Sqfs), the combination of quartz with glauconite (Sqgl), quartz and carbonate fragments (Sqca), and quartz and shells (Sqsh).

The allocation based solely on a dominant nature of tempering remains when the tempering aspect predominates over the mineralogical and lithic inclusions. The mineralogical features are noted along with the tempering agent in the descriptive code. Group C becomes the bone class (B) and Group E corresponds with the grog class (G). Additionally, a slag class (O) and a plant class (PL) have been created as well, to incorporate for all tempering agents found in the handmade material. Arguably, shell (SH) and lithics (L) also belong in this order, however, these are often the result from natural tempering, in which case the potter was either unaware of these elements, or did not remove them in case temper was needed and provided by the coarse natural composition of the clay. Plant tempering can also be a natural occurrence in the clay and is here only attributed as added temper when the plant material is abundantly present and cannot have gone unnoticed by the potter. The same criteria is used for shells. Lithics, in contrast, are not added as a separate class, because the nature of the rock fragments will place them in another class. As a result, the code for crushed rocks (L) will only be used when discussing tempering agents as a manufacture technique.

Table 11 Goemaere and Van Thienen classification system.

Class	Code	Main characteristics
Plutonic	P	Non-plastics derive from granitic rock
	P1	Red feldspar granites with cuneiform intergrowths
	P2	White feldspar granites
	P2/1	With biotite flakes
	P2/2	With muscovite flakes
	P2/3	With biotite and muscovite flakes
Metamorphic	M	Non-plastics derive from metamorphic rocks
	MLG	Low grade metamorphic rocks
	MHG	High grade metamorphic rocks
Volcanic	V	Non-plastics derive from volcanic rocks
	V1	Volcanic and siliciclastic rock fragments and volcanic minerals take up ≥ 25%
	V2	Volcanic and siliciclastic rock fragments and volcanic minerals take up 5 to 25%
	V3	Volcanic and siliciclastic rock fragments and volcanic minerals take up ≤ 5%
Sedimentary	S	Non-plastics derive only from sedimentary rocks
	Sq	Quartz is the main constituent
Grog	G	Grog is the major tempering constituent
Bone	B	Bone is the major tempering constituent
Slag	O	Slag (ore) is the major tempering constituent
Plant	Pl	Plant is the major tempering constituent
Shell	Sh	Shell is the major tempering constituent

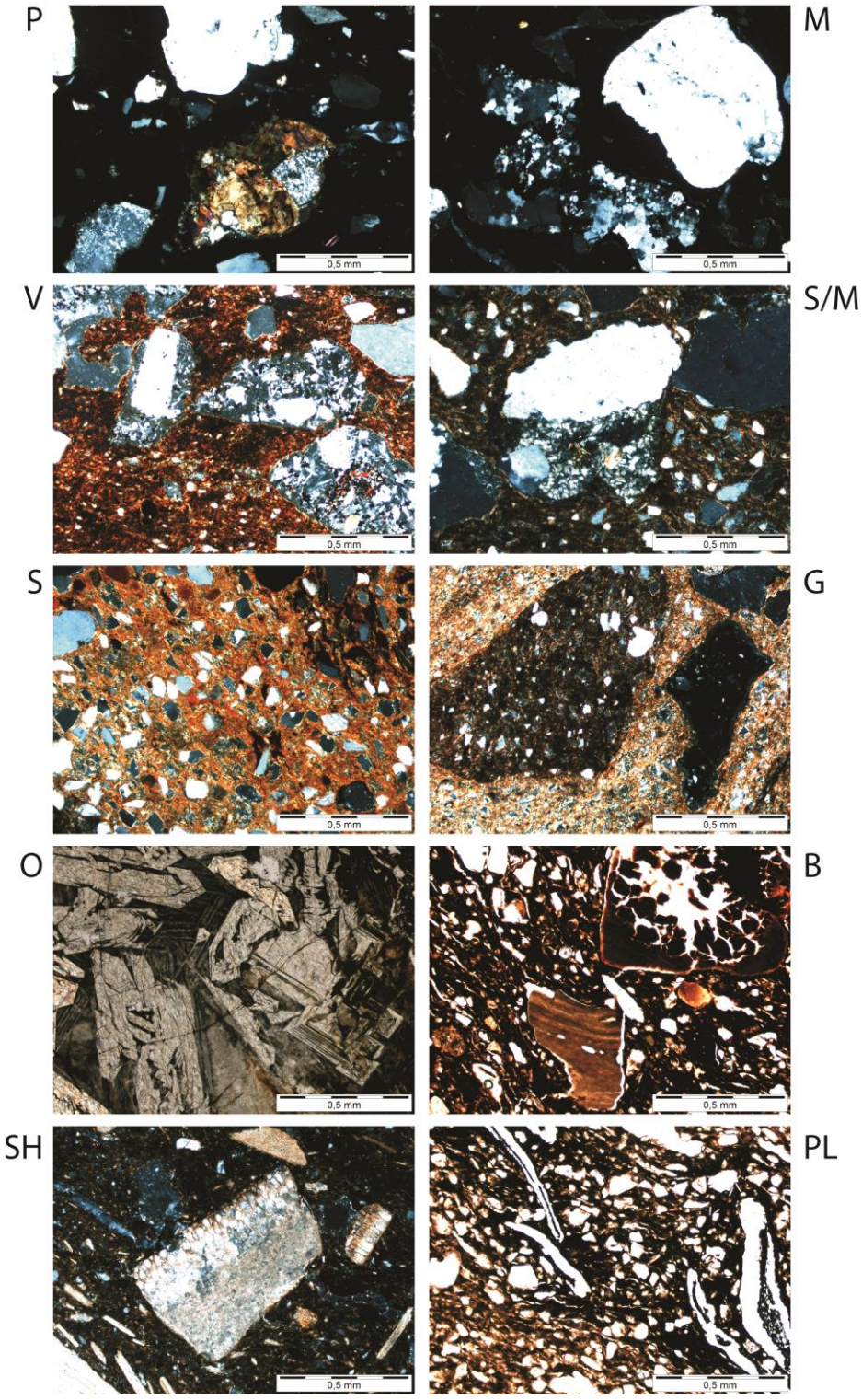


Figure 55 Microphotographs of thin sections of characteristic elements for Late Roman handmade pottery. P: P2/3, LRHM90-Wijster; M: MLG, LRHM24-Hasselt; V: V2q, LRHM07-Lummen; S/M: LRHM05-Lummen; S: Sq, LRHM67-Turnhout; G: Gq, LRHM28-Knesselare; O: Sqo, LRHM16-Sint-Martens-Latem; B: Bq, LRHM81-Wehl; SH: Shsq, LRHM77-Tiel-Medel; PL: Plq, LRHM13-Zele.

6.4 Results

6.4.1 The general composition of Late Roman handmade pottery

6.4.1.1 Petrographic classes and trends

The devaluating properties system is very useful to represent the main characteristic of a sherds' fabric for descriptions and comparison. Furthermore, it quickly gives a sense of the source area or the major tempering technique used in the ceramics. Additionally, it allows a conversion to a complete description in a code for database purposes, when there is no limitation on the amount of codes used to describe a thin section. The multitude of elements present in a fabric can, however, complicate interregional comparisons when represented by an elaborate code which contains all properties observed in a thin section. So, in order to enable a comprehensible overview of the distribution pattern of the related fabrics, two types of classes are considered here. The first type are the geological classes, represented by the plutonic (P), metamorphic (M), volcanic (V) and sedimentary (S) non-plastics. These geological classes will contain the most information on the provenance of the clay source and possibly from what area the pot or clay originates. The second type are the tempering classes, represented mainly by inclusions of grog (G), bone (B), plant (PL) and slag (O). Additionally, shell (SH) and lithic (L) fragments can be seen as an added tempering agent, although these inclusions can also be attributed to naturally occurring in the clay. The same is true for plant matter and shells, which are only identified as a temper clearly intentionally clay by an abundant presence in the thin section. Rock fragments, however, are only considered an added temper when there is clear evidence of crushing the rock, i.e. angular rock fragments. Finally, an additional category 'nat' is created, which simultaneously stands for 'natural' and 'no added temper'. This label envelops either the lack of a tempering agent, or the observed temper is suspected to be of natural origin present in the clay, e.g. small organic and plant inclusions, iron concretions and small mineralogical fragments such as chert.

The first general characterisation of the composition of the handmade pottery in Northern Gaul from the 3rd to the 5th century is extrapolated from the occurrence of the different classes. It has to be noted that there is again a bias, due to an uneven number of samples from the different sites (Figure 59). Correspondingly, the focus is placed on a qualitative evaluation of the trends visible in the data. The first general observation is

that most clays appear to derive from a sedimentary source, followed by a fair number of fabrics containing inclusions from a volcanic nature and only a minor part of the spectrum can be attributed to plutonic and metamorphic sources (Figure 60). In a few cases, it is not quite clear whether the clay in the fabric derived solely from sedimentary rocks, or that it is combined with material originating from an metamorphic source. These samples are represented by the class S/M. Not only in the number of samples is the sedimentary class dominant, but in its presence on the number of sites as well, with 16 out of the 19 sampled sites from Belgium and the Netherlands (Table 12). Which is not surprising, given the sedimentary geology of the Low Countries. It can be argued that the samples with only indications for a sedimentary source are all made locally. However, as mentioned before, other regions outside the research area can also give a strict sedimentary signal.

Table 12 Number of samples per geological class and sites on which they occur.

GeoClass	Number of samples		Number of sites	
P	4	4%	5	26%
M	6	7%	4	21%
V	12	13%	7	37%
S	64	70%	16	84%
S/M	5	5%	2	11%
total	91		19	

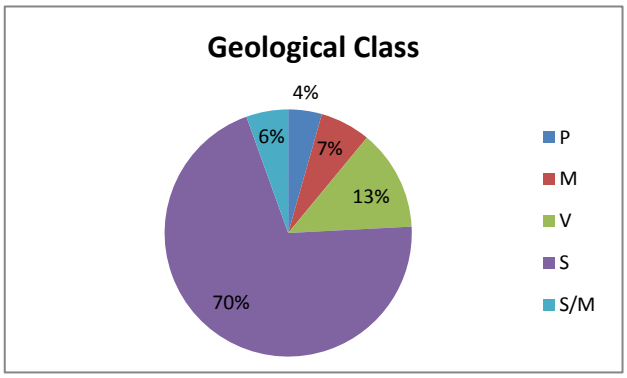


Figure 56 Pie chart of the general geological classes in the petrographic samples (P= plutonic; M = metamorphic; V = volcanic; S = sedimentary; S/M = sedimentary and/or metamorphic).

In addition to the geological tells, we can observe the general trends in the tempering agents (Figure 57). The majority of the samples falls under the 'nat' category, which indicates that many samples have no added temper. This does not mean that these handmade ceramics comprise of fine clays from which all temper has been removed, it

merely indicates that in most cases the natural clay contains rock fragments, shell or plant which sufficed as temper and it was not necessary to add an additional agent. Furthermore, this category will diminish with further detailed study of the thin sections, as more subtle, but intentional, temper can be separated from the natural one. The major added temper consists of grog, in much larger numbers than any other tempering agent (Table 13). However, it is only found on 9 out of the 19 sampled sites, which can be explained by the bias that is Oudenburg in this dataset (see further). Bone, plant, ore, shell and rock fragments are all minor occurrences, comprising of only a few samples and are usually restricted to only a limited spread over the sampled sites.

Table 13 Number of samples per temper class and sites on which they occur.

TempClass	Number of samples		Number of sites	
G	33	36%	9	47%
B	4	4%	4	21%
PL	4	4%	2	11%
O	2	2%	2	11%
SH	5	5%	5	26%
L	2	2%	2	11%
nat	41	45%	13	68%
total	91		19	

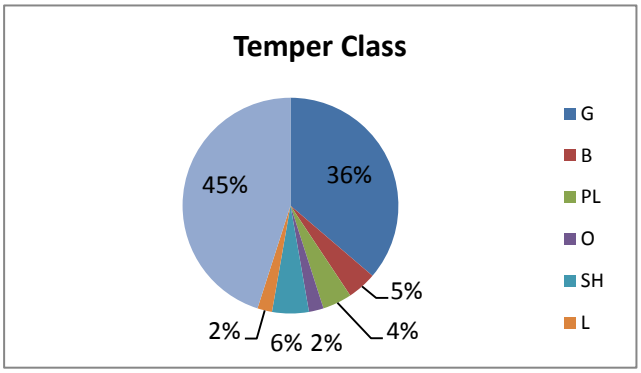


Figure 57 Pie chart of the general temper classes in the petrographic samples (G = grog; B = bone; PL = plant; O = slag; SH = shell; L = lithics).

6.4.1.2 Form vs. fabric

The following general observation consists of exploring trends in the form and/or function of the handmade pottery and explore correlations with the fabric. Due to the high fragmented state of the sampled handmade pottery and the preference from the curators of the collections to select samples from fragments (i.e. to avoid 'nice' specimen,

including complete pot or profiles and rims), not enough data was gathered to reconstruct significant correlations between petrographic classes, pottery form and function. In general, it is observed that most sherds appear to derive mainly from (cooking) pots, with mainly inward or outward bent non-profiled rim (respective rim-codes 12 and 14, after De Clercq 2009, 415) and cups with faint S-shaped shoulder-rim evolution with outward aimed rim (rim-code 4, after De Clercq 2009, 415). Occasionally, a coarse container with a non-profiled rim was encountered. Additionally, most frequent decorative patterns include comb marks (V9) and linear non-crossing grooves (V4), although finger imprints on the rim (V1), linear crossing grooves (V5), a singular arch-shaped groove (part of V8?) and horizontal smoothing lines (V11) were encountered as well (decoration description and code after De Clercq 2009, 420-421). To explore the relation between fabric composition and the functionality of the different handmade vessels, larger assemblages should be studied in a whole. New studies are contributing to the typology of handmade pottery[15] and the recognisability of Late Roman pottery, hopefully resulting in future opportunities to pursue this avenue of investigation.

6.4.2 Distribution of petrographic classes

The next step is to explore the spatial distribution of these classes per site, to establish a local vs. non-local base line. De Paepe and Van Impe (1991) used a similar semi-quantitative approach to compare the geological information from the fabrics with the site distribution of their groups, in which they looked at the percentages of each group per site, rather than to focus on the exact number of finds. We will take a similar approach, although additional graphs and tables are provided with the exact number of samples for each class per site as well.

[15] Such as the recently finished PhD of N. Venant (ULB).

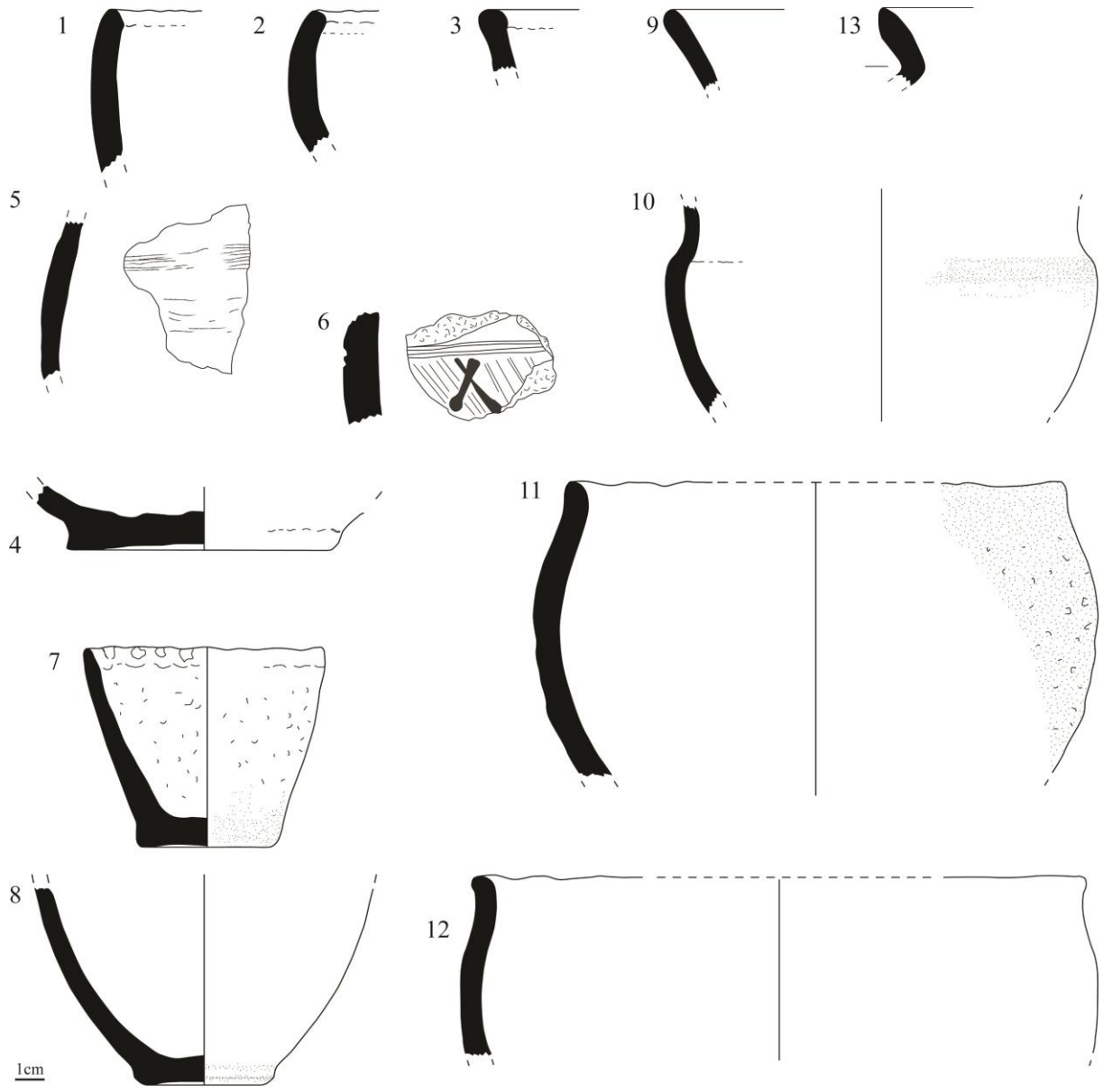
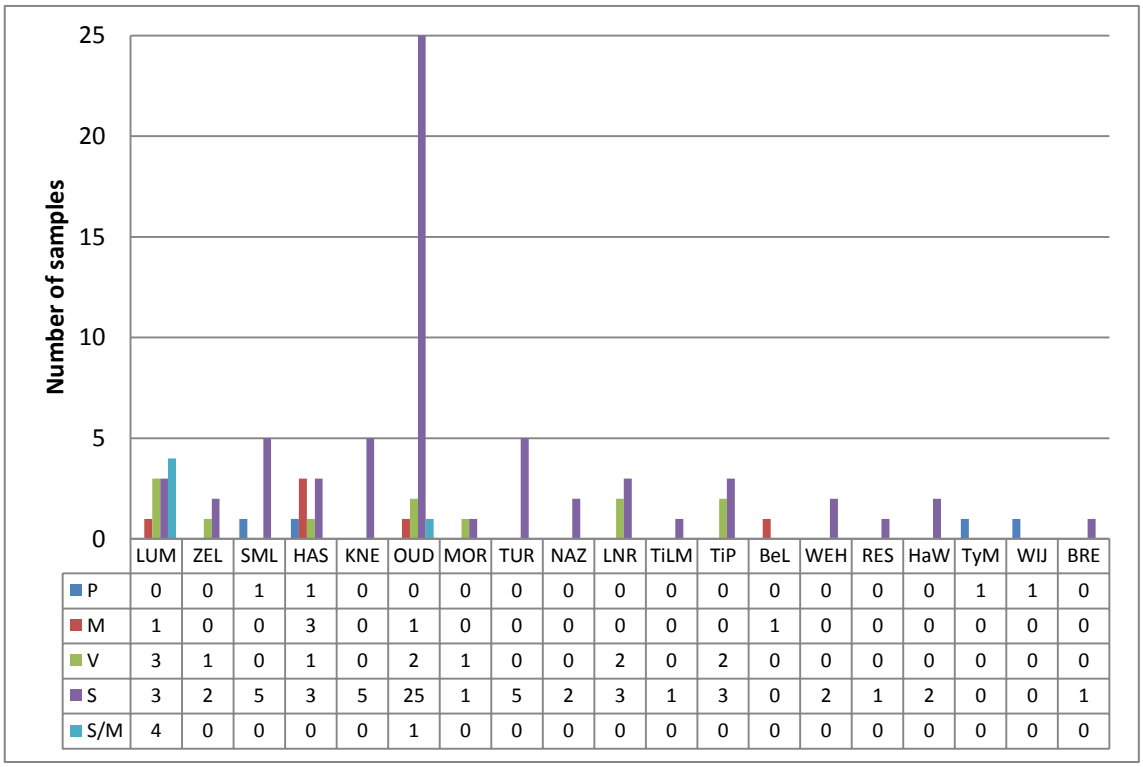


Figure 58 Diagnostic handmade sherds and pots from Flanders that have been sampled for petrographic analysis: 1-4. Meldert, 5-6. Knesselare, 7-12 Hasselt, 13. Turnhout (drawings by J. Angenon) – scale 1:3.

6.4.2.1 Spatial distribution and trends

The overall image from the geological classes shows that the sedimentary class is found in samples from each Belgian site, as well as on most sites in the Netherlands with the exceptions of Beneden-Leeuwen, Tynaarlo and Wijchen (Figure 59). The latter two are represented by only one sample, containing clay derived from a plutonic source. Similarly, one sample of the plutonic class occurs on the Belgian sites of Sint-Martens-Latem and Hasselt. The sherd from Beneden-Leeuwen is characterised by inclusions deriving from metamorphic rocks, which also occurs in samples from Lummen, Hasselt and Oudenburg. The few other examples that might contain traces of metamorphic rock

are found in Lummen and Lanaken. None of these classes show a bias towards the Belgian or the Dutch sites, in contrast to the volcanic class, which is only found in 2 sherds from Tiel-Passewaaij for the Netherlands, although occurs on Lummen, Zele, Hasselt, Oudenburg, Mortsel and Lanaken for Belgium. Furthermore, the spectrum from Hasselt and Lummen shows an interesting variation (Figure 59). Where most sites exhibit one or two geological classes, these two sites have four. Lummen features all classes and Hasselt only lacks evidence for plutonic clays. Nevertheless, this is an interesting combination, suggesting that these two sites deviate from the other sites by their variation of handmade pottery. Finally, it is evident that Oudenburg represents a bias in the dataset by a much larger number of samples (Figure 59), however, this appears only relevant for the sedimentary class at this point. The number of samples for the other classes are similar to those of the other sites. The Dutch sites represent another bias here, by too few samples, resulting in a skew image for the presence of these classes in the Netherlands. To take this into account, these results will be compared to the additional dataset of De Paepe-Van Impe and Degryse-Opsteyn later on.



	LUM	ZEL	SML	HAS	KNE	OUD	MOR	TUR	NAZ	LNR	TiLM	TiP	BeL	WEH	RES	HaW	TyM	WIJ	BRE
P	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
M	1	0	0	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
V	3	1	0	1	0	2	1	0	0	2	0	2	0	0	0	0	0	0	0
S	3	2	5	3	5	25	1	5	2	3	1	3	0	2	1	2	0	0	1
S/M	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 59 Number of samples for each petrographic 'geological class' per site. For the full names of the sites and classes, see respectively Table 9 and Table 10.

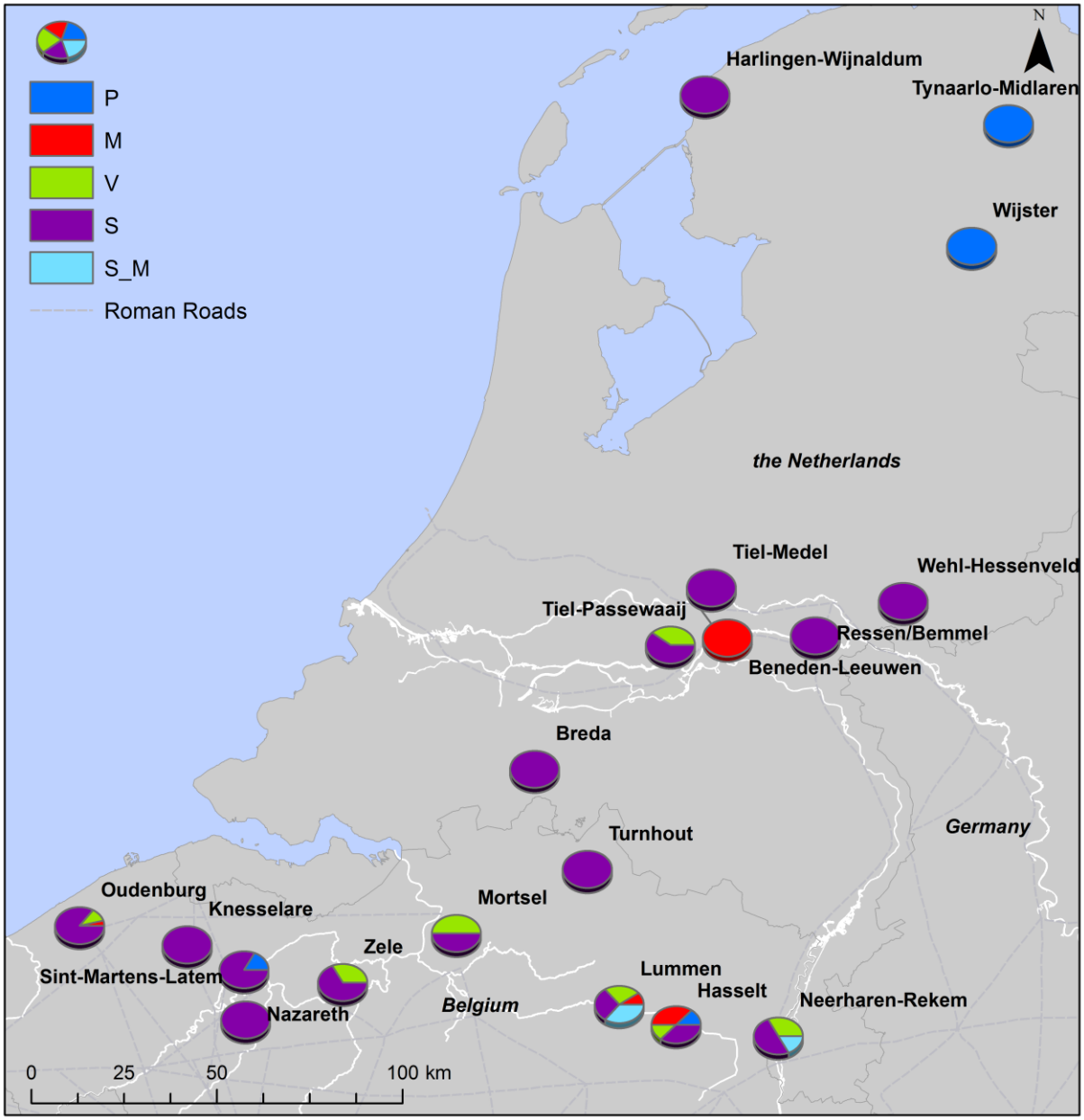


Figure 60 Distribution of petrographic classes characterised by mineralogical indicators. Each pie chart expresses the presence of each 'geological class' and illustrates the fabric variation per site. The number of samples per site vary, see Table 12 and Figure 59. All sites can be dated to the 4th and 5th century, except for a 3rd century date of Zele and Knesselare, as well as a 3rd-4th century transition date for Turnhout.

The overall trends from the tempering classes indicate that grog tempering was very common on Belgian sites, where samples are found from every site except for Zele and Lanaken (Figure 62). In contrast, the samples from the Netherlands show a lack in grog tempering, with Breda as the exception. As mentioned, the large number of grog tempered sherds is biased by the large representation of Oudenburg in this matter (Figure 62), however, the general trends per site indicate that this is not such an extraordinary

feature as first thought. This technique is very common in the earlier Roman periods and seems to continue on, as will be discussed further on. More intriguing are the other tempering mechanisms, which are less frequent (Figure 62). The bone tempering occurs on only 4 different sites in Belgium and the Netherlands – Beneden-Leeuwen, Ressen-Bemmel, Knesselare and Nazareth – each time in only one sample. Moreover, the plant temper is only present on two sites: Zele and Sint-Martens-Latem. Similarly, evidence for slag tempering is found merely twice: in Lanaken and Sint-Martens-Latem. These final two tempers appear to be limited to Belgian sites. In contrast, the shell temper appears to be more widespread, occurring on 5 different sites from both the Netherlands and Belgium: Oudenburg, Lanaken, Tiel-Medel, Tiel-Passewaaij and Ressen-Bemmel. Furthermore, taking into account the underestimation of the lithic class, convincing evidence for crushed rock fragments is found on only two occasions in samples from Hasselt and Sint-Martens-Latem. The nature for these restricted tempering techniques needs to be contextualised before further interpretations can be made. Nevertheless, the variation in tempering agents on separate sites gives us a first insight into the tempering techniques in the handmade pottery. This mainly consists of one or two different tempers (three when counting the 'nat' category as a tempering class). The single exception is Sint-Martens-Latem, which exhibits five different tempering agents: grog, bone, plant, slag and crushed rock.

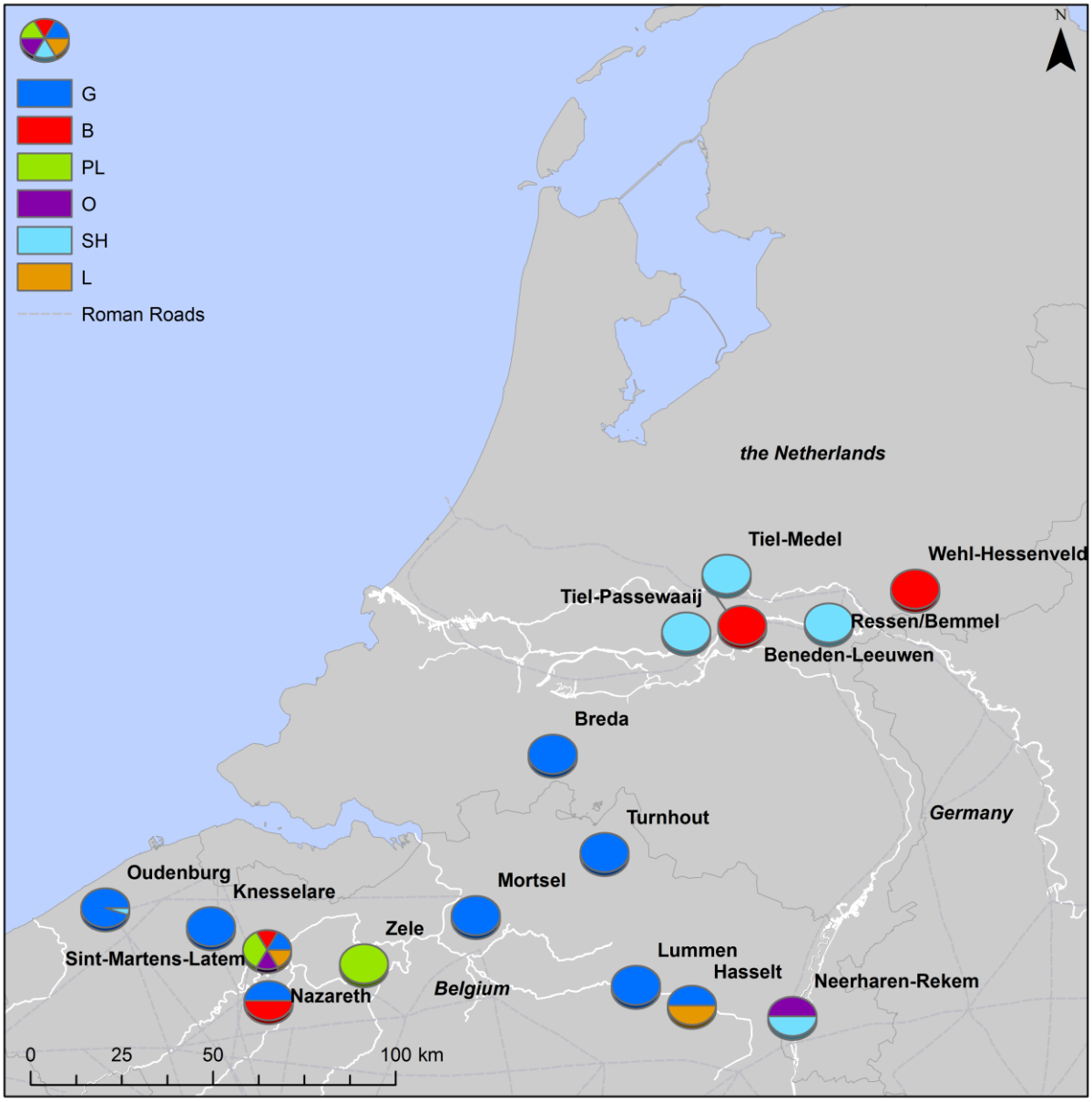
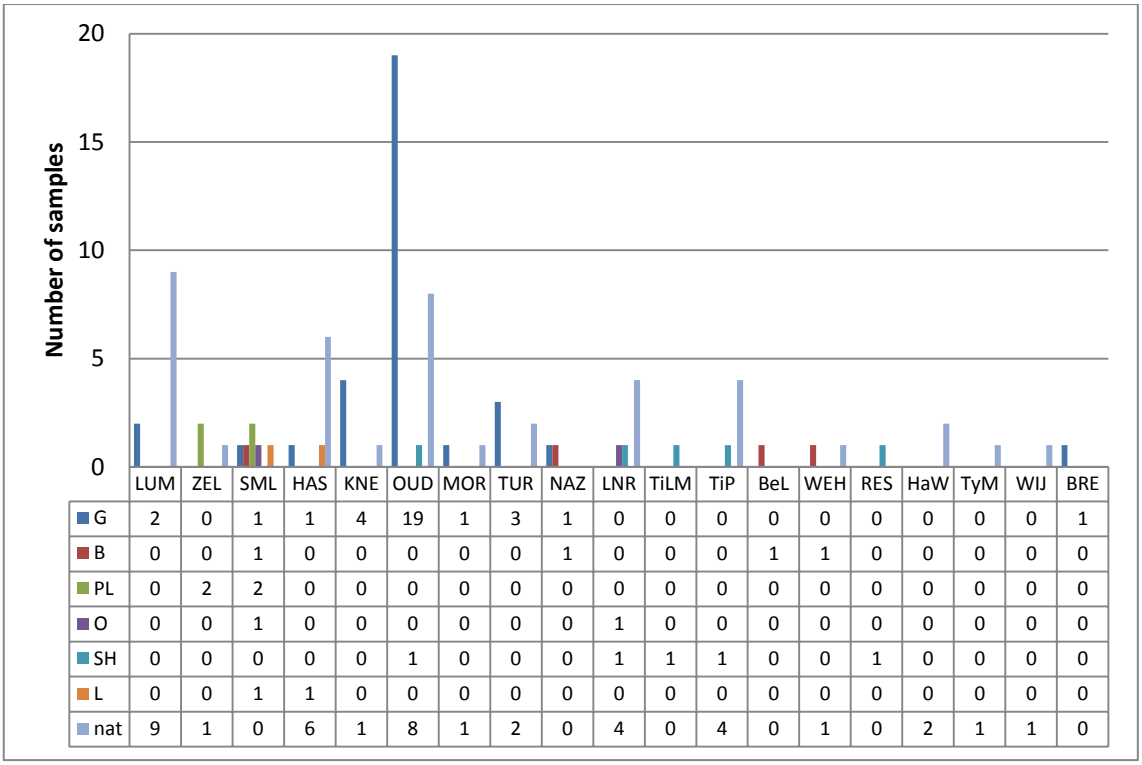


Figure 61 Distribution of petrographic classes characterised by temper indicators. Each pie chart expresses the presence of each temper class' and illustrates the fabric variation per site. The number of samples per site vary, see Table 13 and Figure 62. All sites can be dated to the 4th and 5th century, except for a 3rd century date of Zele and Knesselare, as well as a 3rd-4th century transition date for Turnhout.



	LUM	ZEL	SML	HAS	KNE	OUD	MOR	TUR	NAZ	LNR	TiLM	TiP	BeL	WEH	RES	HaW	TyM	WIJ	BRE
G	2	0	1	1	4	19	1	3	1	0	0	0	0	0	0	0	0	0	1
B	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0
PL	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SH	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	0	0	0	0
L	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
nat	9	1	0	6	1	8	1	2	0	4	0	4	0	1	0	2	1	1	0

Figure 62 Number of samples for each petrographic 'temper class' per site. For the full names of the sites and classes, see respectively Table 12 and Table 13.

Before continuing, it is necessary to elaborate briefly on the specific case of vitrified grog grains. Vitrified entails that the grog fragment has become glassy in appearance under a polarised microscope. In PPL it can appear as a light or dark angular to sub-rounded inclusion containing a complex internal structure, which becomes dull homogenous grey with bright inclusions (usually quartz). Additionally, it does not show any optical activity, i.e. no extinction is visible when the thin section is rotated, suggesting a high firing temperature for these ceramic elements (Figure 63). A total of 19 samples from Oudenburg contains one or more vitrified grog grains, as well as two samples from Knesselare, one from Sint-Martens-Latem and one from Hasselt. The same sample can contain only vitrified grog grains or it can contain a mixture of vitrified and non-vitrified grog grains. It is not exactly clear whether these highly fired ceramics come from misfiring or if they come from crushed up crucibles. More detailed investigation is needed to confirm the origin of this grog type.

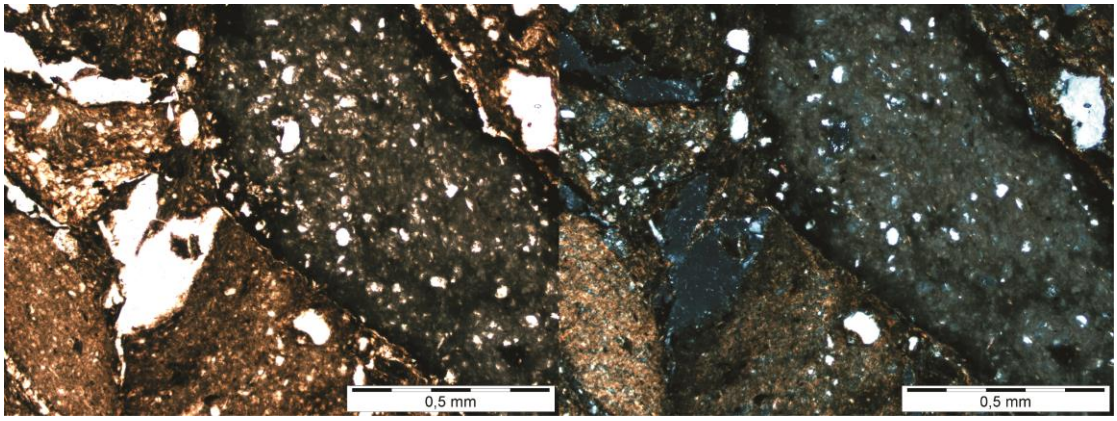


Figure 63 Microphotograph of thin section LRHM33 in PPL (left) and XP (right) illustrating a vitrified grog grain.

6.4.2.2 Geological vs. temper classes

When we cross-reference the geological and the temper classes (Figure 64 and Table 14), we can see that the grog-tempered ware is limited to clays with only sedimentary derivatives. The same is true for the plant, shell and slag temper, although these numbers are far less significant in comparison with the grog tempering. In contrast, we see that the sedimentary class contains all tempering agents, except for crushed rock fragments. The limitation of lithic temper in the plutonic and volcanic class can indicate that not all rock fragments of with this nature were present in the natural clay, they could have been added as crushed rock fragments, either in the region where these geological elements occur, or locally with access to stones from another landscape. Similarly, the only added temper encountered with metamorphic rock fragments are bone inclusions, although bone itself is not restricted to fabrics deriving from metamorphic source. They occur more commonly in correspondence with sedimentary clays. Furthermore, the correspondence of the shell temper with the sedimentary sources can either be naturally derived from limestone and in that way embedded in the fabric as a natural feature or added lithic temper. Or shells can be added as fresh (marine) material, deriving from eating molluscs such as mussels. Depending on the fossilised or fresh nature of the shells, this distinction can be made from the thin section. Additionally, grog dominates the sedimentary spectre, followed by the 'nat' category, which is dominant in every other geological class. Indicating that it was unnecessary to add extra temper in case of the clays deriving from plutonic, metamorphic and volcanic sources. The opposite can also hold true, meaning that it was necessary to add temper to the sedimentary clays to create the wanted handmade vessels.

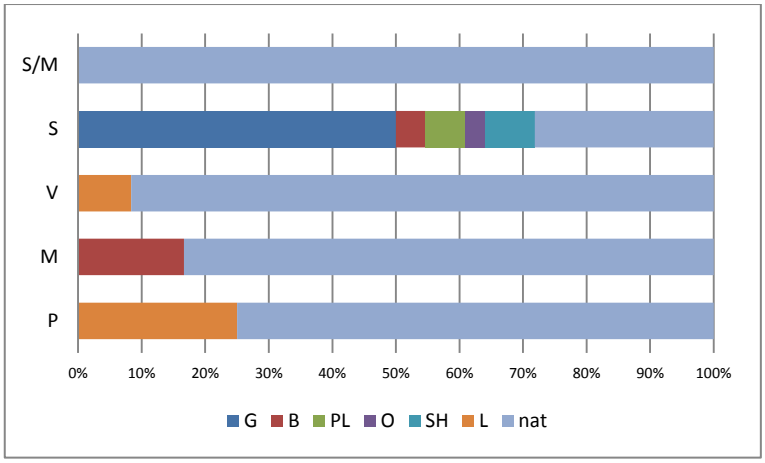


Figure 64 Chart with cross-reference of 'geological' and 'temper' classes (for the full names see Table 11). Sample amount: P = 4; M = 6; V = 12; S = 64; S/M = 5.

Table 14 Cross-reference of geological and temper classes.

	G	B	PL	O	SH	L	nat	*total*
P	0	0	0	0	0	1	3	*4*
M	0	1	0	0	0	0	5	*6*
V	0	0	0	0	0	1	11	*12*
S	32	3	4	2	5	0	18	*64*
S/M	0	0	0	0	0	0	5	*5*
total	*32*	*4*	*4*	*2*	*5*	*2*	*42*	*91*

6.4.2.3 Comparison with previous research: an interregional petrographic inventory

The datasets available from the studies of De Paepe-Van Impe[16], Bouquillin-Tuffreau-Libre-Leclaire and Degryse-Opsteyn were comparable as a result of the use of the same methodology to identify petrographic groups in the Late Roman handmade pottery. After compiling an accumulative dataset, only the samples with a 4th and 5th century date were kept, which resulted in an petrographic inventory of 331 Late Roman handmade pottery samples from 63 sites from Belgium, the Netherlands, northern France and northwest Germany (Appendix 2). The petrographic groups used in the visualisation of the distribution are the general groups from De Paepe and Van Impe, because it is the

[16] The complete dataset of De Paepe and Van Impe has been made available for further study, including the unpublished data. For this we are very grateful and this has allowed us to make the current comparison more complete and gives us the opportunity to refine the research in a future stage.

common denominator in these 4 studies and allows for the best comparison. The representation of the sites is a single dot distribution map, i.e. one site one dot, because the quantified representation of the data would reveal nothing more than an archaeological state of research and would be biased by sample selection and availability. Therefore, the distribution of each petrographic group is qualitatively approached.

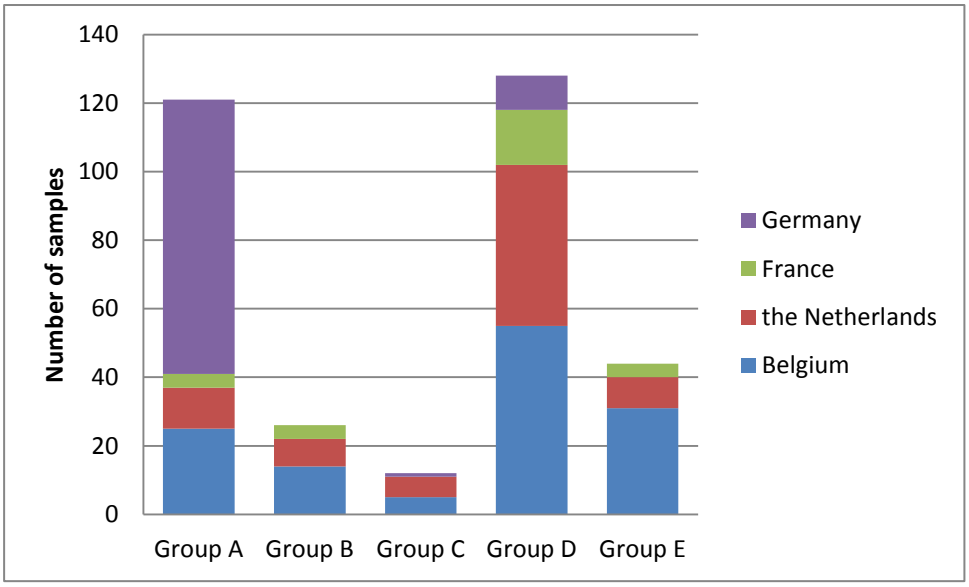


Figure 65 Chart illustrating the sample amount for each region and frequency for the petrographic groups from the classification of De Paepe and Van Impe.

Table 15 Number of samples and number of different sites is given for each petrographic group from the classification of De Paepe and Van Impe for each country. The star marks the absence of a group in the samples from that region.

	Belgium		**the Netherlands**		**France**		**Germany**		**Total**	
Group	samples	sites	samples	sites	samples	sites	samples	sites	samples	sites
A	25	12	12	8	4	2	80	11	121	32
B	14	11	8	5	4	3	*	*	26	19
C	5	3	6	4	*	*	1	1	12	7
D	55	17	47	13	16	5	10	5	128	41
E	31	10	9	2	4	3	*	*	44	15
total	*130*	*23*	*82*	*19*	*28*	*9*	*91*	*15*	*331*	*63*

It has to be stressed here, that the image presented here is a reflection of the archaeological research, in which three studies mainly considered Belgium as the primary research area. As a consequence, the Dutch sites have to be seen as a comparative region in order to look for a provenance for the Belgian ceramics. In contrast to the

number of German samples, the amount of shards from northern France analysed by petrography is much less than for the other areas (Figure 65).

Sherds belonging to Group A contain non-plastics derived from plutonic and metamorphic rocks (classes P and M), which are not indigenous to Belgium. It has been mentioned before that this group is defined too broadly. For instance, the French samples contain only metamorphic inclusions, no plutonic. No distinction between these two sources were made in the two other Belgian studies. Additionally, the review of this group is still on-going (collaboration with E. Goemaere), so for now we are limited to consider this as one group.

In general, the initial results and distribution of this group can be confirmed. In the original study, Group A was found in 14 samples from 7 different sites in Belgium and the Netherlands. The remaining 80 sherds from 9 sites originated from northwest Germany. The current study encountered 10 more samples (combined P and M) from 7 different sites in Belgium and the Netherlands. Together with the additions from Degryse and Opsteyn and the northern French material, this results in a presence on 32 sites with a total of 121 sherds that are dated to the 4th and the 5th century. The sites in Germany remain dominant with 80 samples, compared to 25 for Belgium, 12 for the Netherlands and 4 for northern France (Figure 65). Despite the uneven sample population for the different regions, the cluster in the northern Germanic territories is evident and supports this area as a potential source area for Group A.

The second group with 'exotic' geological indications is Group B, which had initially only a limited spread of 2 samples for 2 different sites in the study of De Paepe-Van Impe and did not occur in the sampled sites from Germany. This group corresponds with the volcanic class, which is better represented in the current study with 12 samples from 6 different sites. With the additions from the two other studies, the total amount reached 26 samples on 19 different sites, marking this as the second smallest group in the classification of De Paepe-Van Impe. Additionally, we need to mention the presence of this group in the recent excavation on the Belgian site of Baelen-Nereth (Hanut, Goffioul and Goemaere 2012, 246; Hanut, et al. 2013, 153). Although the volcanic material is not indigenous to the geology of the sampled sites in Belgium and the Netherlands, evidence from German samples is still lacking. Its origin was placed in the Eifel region by De Paepe-Van Impe, from which neither they nor this current study have comparative samples, but the French volcanic inclusions were believed to correspond with basaltic lava from the

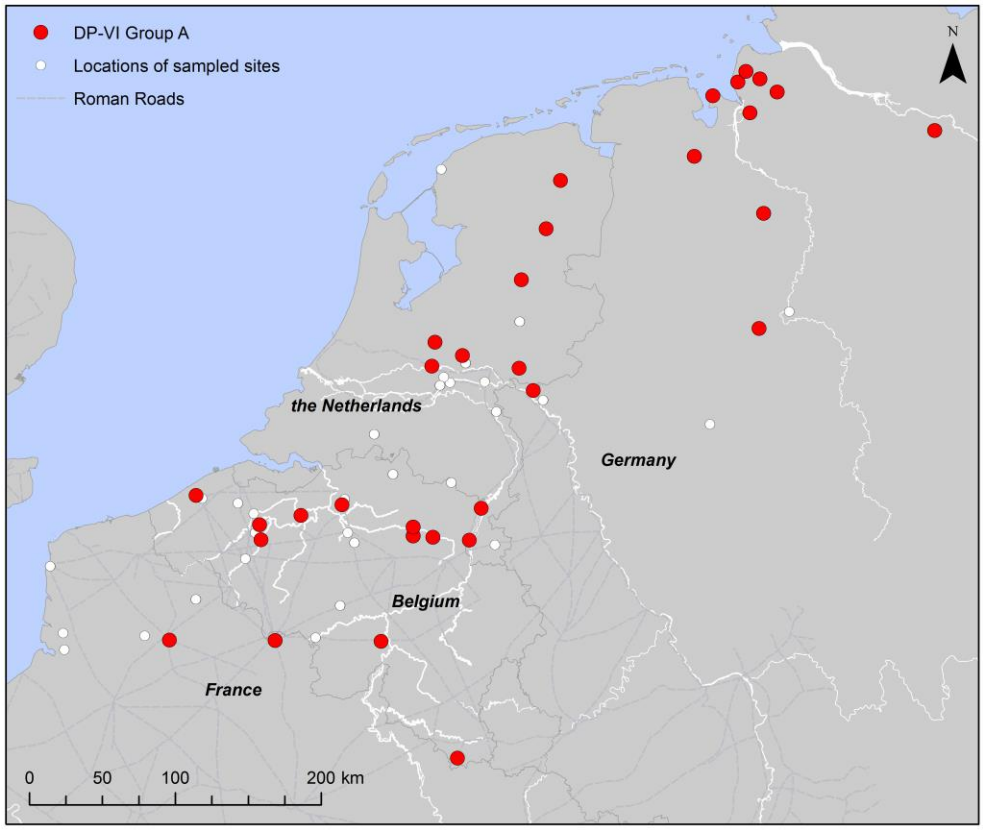


Figure 66 Location of the sites with the presence of one or more petrographic samples from 4th and 5th century Roman handmade ceramics belonging to Group A from the classification of De Paepe and Van Impe.

Eifel region, potentially from the Mayen or Maares area (Bouquillon, Tuffreau-Libre, Leclaire 1994, 231-233).

The smallest group in this comparison is Group C, characterised by bone temper. This group occurred initially only in 3 samples from 2 sites, both in Belgium. In comparison to the current findings of 4 samples of 4 different sites, equally spread over two sites in Belgium and the Netherlands, this appears to be an extension of the result of De Paepe-Van Impe. An additional 4 samples derived from the Degryse-Opsteyn collection, bringing the total on merely 12 samples from 8 different sites. Four of these sites are located in the southern Netherlands and the German site is directly adjacent to these sites at the other side of the Rhine. In light of these additions, the bone tempered ware might be appointed to the Lower Rhine area, rather than originating from the tertiary clay from Low and Middle Belgium, as suggested by De Paepe (De Paepe and Van Impe 1991, 167).

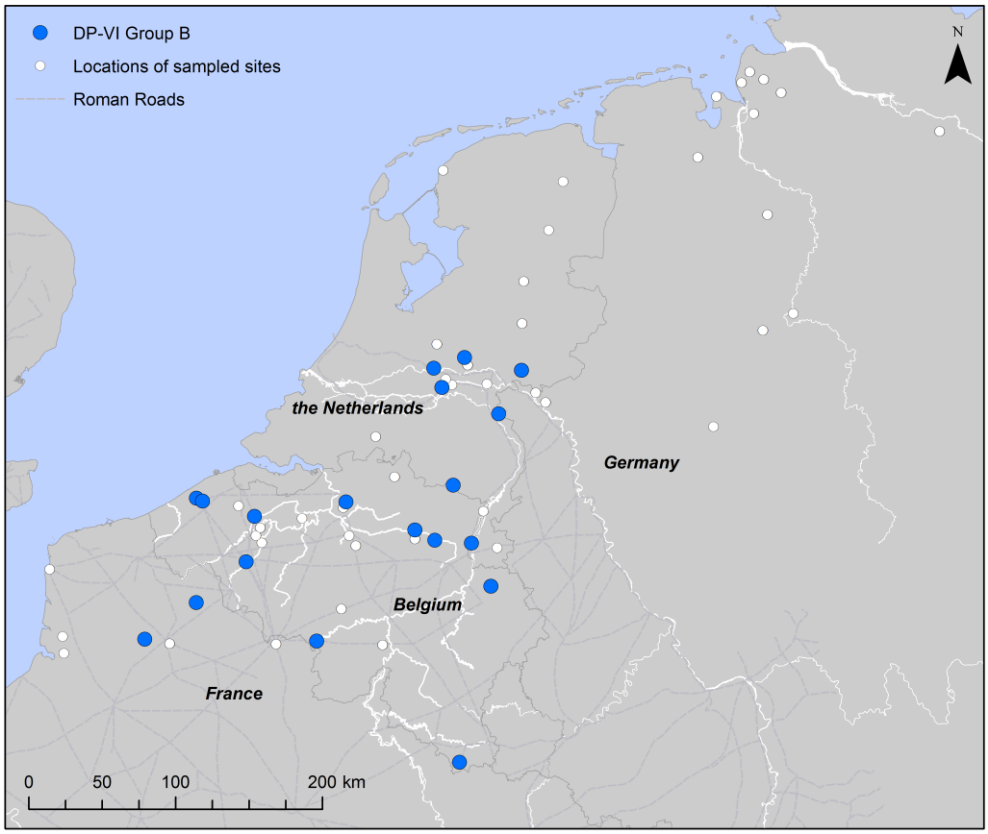


Figure 67 Location of the sites with the presence of one or more petrographic samples from 4th and 5th century Roman handmade ceramics belonging to Group B from the classification of De Paepe and Van Impe.

The distribution and amount of samples for Group D, corresponding with the sedimentary class, clearly indicates that this is the main group for Belgium and the Netherlands. It is also the largest group in the north French material and additionally appears in far lesser numbers in the northern German samples. Initially, group D was encountered in 61 samples from 10 different sites for this group, combined with the data from the current and the other studies, makes a total of 128 samples present on 40 sites. This surpasses Group A in numbers and spread, considering that approximately 1/3rd of the Group A samples come from the north German cluster.

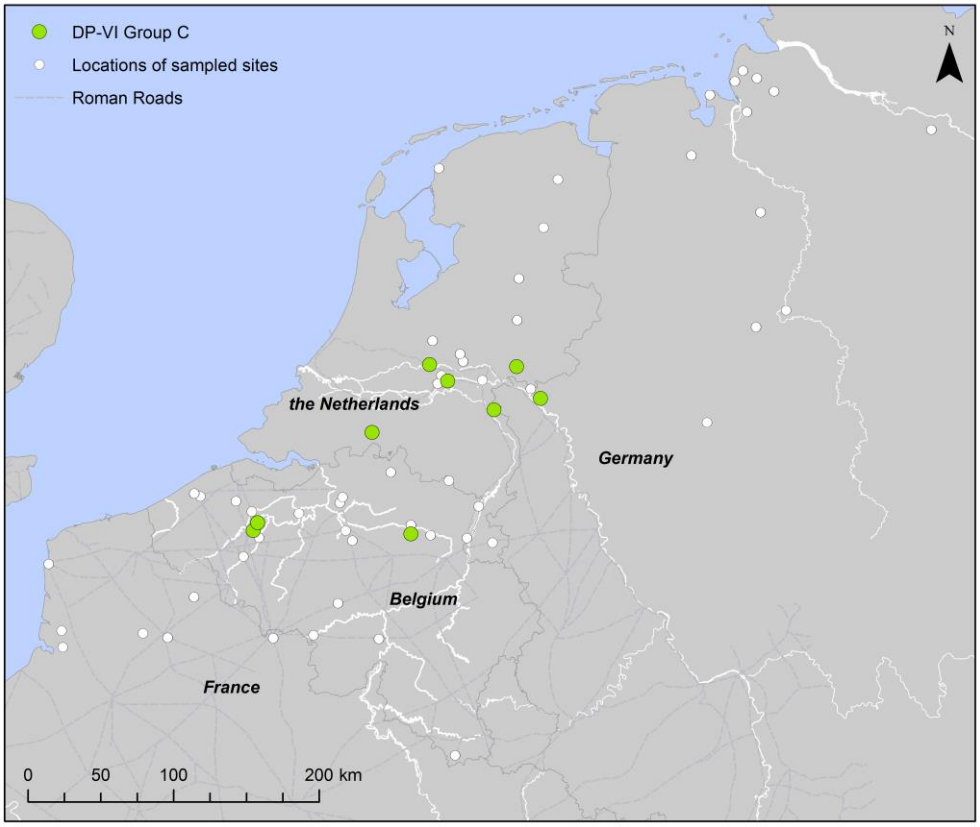


Figure 68 Location of the sites with the presence of one or more petrographic samples from 4th and 5th century Roman handmade ceramics belonging to Group C from the classification of De Paepe and Van Impe.

The petrographic analyses of sherds from Baelen-Nereth by Goemaere, revealed that the largest fabric group of the Germanic ceramics belonged to the group D (mainly subgroup D1), and displayed much similarities with the northern French ceramics of this fabric, posing the question if these are related or can be seen as a potential provenance area (Hanut, Goffioul and Goemaere 2012, 246). According to De Paepe and Van Impe, Group D represents small localised productions in the main part of Belgium, and we can add now the larger parts of the Netherlands and the region of Pas-du-Calais as well. Furthermore, the variation in the sedimentary class supports the assumption that the pots with this fabric were made near the source, possibly even in domestic context or small rural communities. Although the variations with coarse rounded quartz, rock debris and the absence of feldspar from Baelen are considered to come from fluvial deposits with connections to the Taunus or Hunsrück area in Germany (Hanut, Goffioul and Goemaere 2012, 246). Additionally, the potential link between these samples and those from northern France, suggest that the short source-to-site explanation does not cover the complete story for the sedimentary group.

To compare the subgroups of Group D in sufficient detail with the other studies is not possible based on the data provided in the publications and reports. Degryse-Opsteyn combined certain subgroups, Bouquillon and her colleagues did not use the same classification and the sedimentary subgrouping has been altered in the new classification system. However, we need to consider subgroup D3 separately. This group contains non-plastics derived from calcareous rocks and often contains limestone, but more importantly shells, which are very recognisable in a macroscopic observation. Degryse and Opsteyn considered them separately and added 3 samples to the initial 3 sherds from Liberchies (De Paepe and Van Impe 1991, 160). These additions originated from Erps-Kwerps, Maaseik and Melden (Oudenaarde). In all, this represents a strange distribution, given the French parallels occur in Arras, Boulogne and Vron, which are more likely to have been produced locally. Bouquillon and her colleagues observed that the shell material of Pas-du-Calais was associated with coastal sediment and concluded a provenance from the coastal plain of the North Sea area. In the new samples, only 5 additional examples were found containing shell fragments, from Oudenburg, Neerharen-Rekem, Tiel-Medel, Tiel-Passewaaij and Ressen-Bemmel. This distribution does not seem to fit with the short source-to-site distance De Paepe and Van Impe suggested for Group D. Also peculiar is the evident lack of shelly material in the Dutch comparative samples, especially with the recent evidence from the site of Wijk-bij-Duurstede – De Geer, where shell temper is the main temper for the Late Roman handmade pottery (Heeren, forthcoming). Additionally, only two other sites from the Dutch river area can be added to this list: Geldermalsen-Hondsgemet and Ede-Wageningen, both dated in the Late Roman period (Pers. Communication S. Heeren).

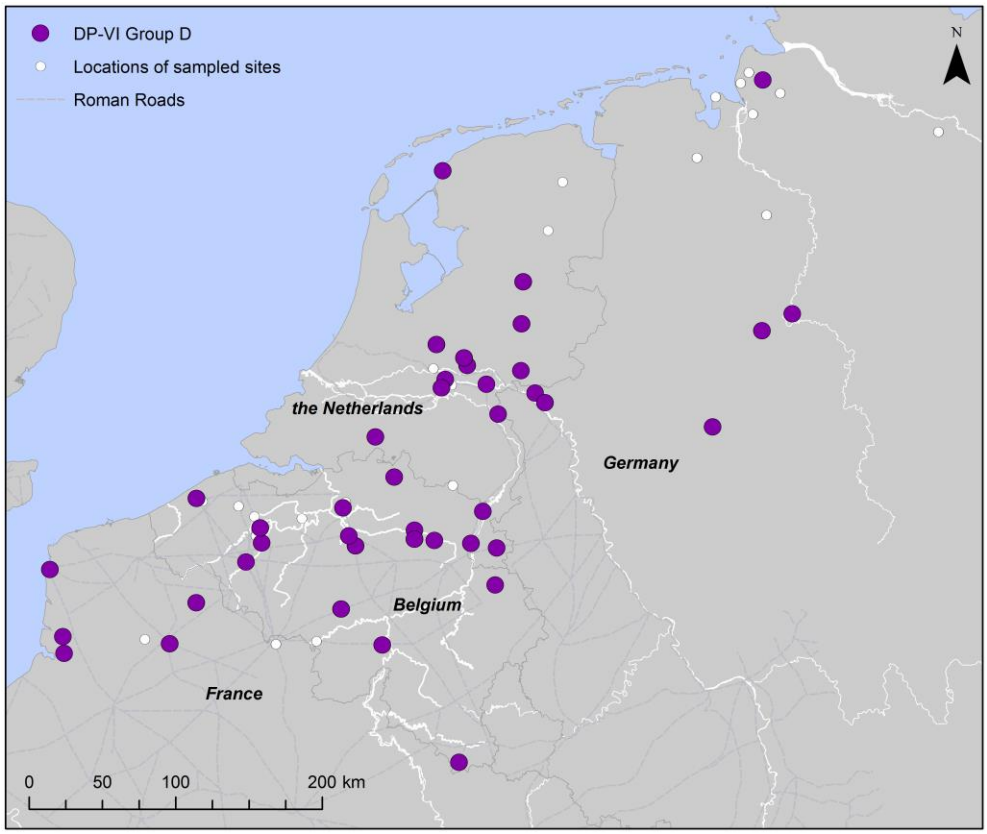


Figure 69 Location of the sites with the presence of one or more petrographic samples from 4th and 5th century Roman handmade ceramics belonging to Group D from the classification of De Paepe and Van Impe.

In general, most results from this interregional comparison support or elaborate on the results and interpretation of De Paepe and Van Impe. The grog Group E, however, turned out differently from the new samples. In the initial study, it is the second largest group in the Dutch samples, although, much less so in the Belgian samples: in total only 9 samples from 3 sites, of which only 1 Belgian sample. The contrast with the 32 samples from 9 different sites in the current study is noteworthy. This contrast can partially be explained by the search for 'Germanic' material in the research of De Paepe-Van Impe, i.e. the neglect for local ware, as well as the dominance of Oudenburg in the present sample selection, a site that was not yet excavated at the time of the previous study. The study of Degryse and Opsteyn do not contribute anything to this group, due to the neglect of local produced wares in their search for evidence of migration. From the region of Pas-du-Calais, however, a similar image to the new Belgian-Dutch samples arose. Grog, or chamotte, was encountered many times, although mainly in their 1st century comparative material, and was considered a local provenance due to its association with sedimentary clays. As is also the case for the new samples. Interestingly, there seems to be a grog-tempered ware restricted to the southeast of Britain in the 4th century and is viewed as a

social or cultural construct of local identities (Gerrard 2013, 222-229). From the study of De Clercq (2009), we know that grog is a common feature in the first 3 centuries AD in the Roman landscape of Flanders, which we can now extend into the 4th and 5th century as well. From the first distribution pattern, this seems to be a traditional technique within Northern Gaul, however, this is still too soon to tell.

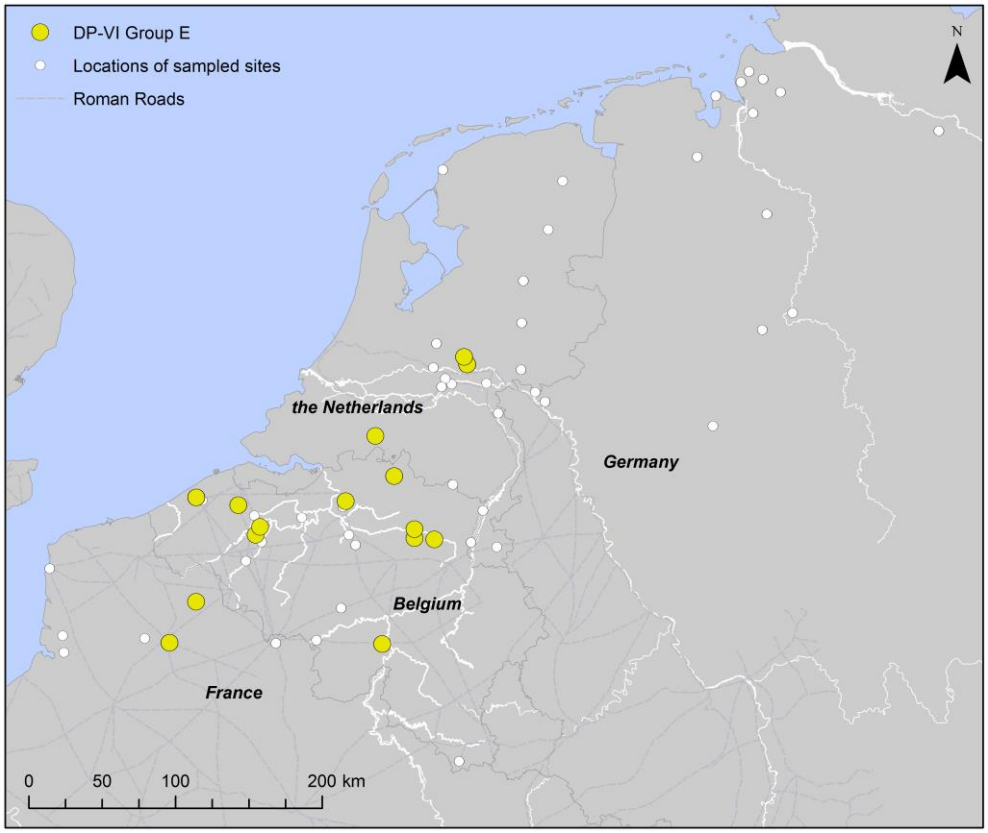


Figure 70 Location of the sites with the presence of one or more petrographic samples from 4th and 5th century Roman handmade ceramics belonging to Group E from the classification of De Paepe and Van Impe.

In general, we can conclude that it is necessary to divide Group A in the separate plutonic and metamorphic components in order to make a better distinction and make a more accurate consideration of the potential provenance areas. Especially, because this group is the main group representing migration and mobility from north of the Rhine into northern Gaul. The volcanic group B has been expanded, but still remains a minority group in the overall spectrum of Late Roman handmade pottery. In a next sampling phase, it would be necessary to obtain some comparative handmade Eifel ceramics from the 4th and 5th century, taking into consideration a potential provenance in the Mayen or Maares area in that region. Besides the non-local groups, connected with migration and/or economic networks, there has been a confirmation of the sedimentary group as

the local ware. Although this seems evident, it still remains necessary to be vigilant and to evaluate these fabrics in the same manner as the non-local ones. The provenance and distribution of the shell tempered ceramics, for instance, is unclear at this point, although a short source-to-site scenario seems unlikely, if the findings from Pas-du-Calais are correct in placing the origin clay in the North Sea coastal plain. Finally, some extra evidence has been provided for the bone and grog tempered ware. The grog can with confidence be regarded as a continuation of a local tradition, potentially for the entire region of northern Gaul. The study of De Clercq confirms this image for the western part of the research area, where grog has been a common temper from BC 50 to AD 270 (De Clercq, 2009, 423-441). The provenance of the technique of adding bone material, however, is not as clear cut. At this point, the limited distribution pattern indicates a potential origin area in the Lower Rhine zone.

6.4.3 Refining the chronology of Late Roman handmade pottery

6.4.3.1 Chronology of the sampled contexts

A third step in the exploration of the significance of the petrographic classes, besides compositional description and spatial distribution, is the potential connection between fabric and chronology. There are, however, some dating problems and biases with Late Roman handmade pottery. The main problem with adjusting the chronology of this ware is based on the presumed 'Germanic' character of every handmade vessel that looks unfamiliar and exotica. It is not denied that many of these sherds have tangible connections with the areas from across the Rhine, nor that these can be placed in the traditional cultural sphere of Germanic migrants (see theory). It is merely the intent here to point out that a tendency arose towards the final part of the 20th century to consider all Germanic sherds within the Roman timespan as Late Roman. These were all dated in (the second half of) the 4th century and first half of the 5th century and placed within the historic narrative in the Migration period. Consequently, many contexts with similar 'Germanic' material were dated on the presence of these sherds and a circular reasoning was created. It is only in strong association with earlier or later material that this was avoided, such as Zele for the 3rd century and Wange for the 5th century. As a result, most contexts containing the Late Roman handmade pottery from this study and the comparative studies (De Paepe-Van Impe, Degryse-Opsteyn) can only be dated generally as 4th to 5th century. Consequently, an attempt is made to refine these broad date ranges

based on a systematic review of the Belgian contexts from which samples have been collected for this study. The restriction to the Flemish sites is in consideration of the knowledge of the archaeology of the Late Roman period for this area (see Late Roman inventory). At this point, however, this exercise remains merely a first step in order to explore the possibilities and raise awareness of the circular reasoning for future research in Roman handmade pottery.

This chronological review starts with the samples from the oldest excavation at Lanaken – Neerharen-Rekem (De Boe 1983). Unfortunately, we were unable to recover many of the documents and materials from this site, so certain nuances of the contexts from which the samples derive have been lost. Three samples were taken from the fillings of different sunken hut features, which have been dated between AD 360 and 450. The recent re-evaluation of the numismatic evidence from Neerharen-Rekem puts a coin peak in the last two decades of the 4th century: AD 380-400 (Stroobants 2013). Additionally, two samples that were selected based on 'Germanic' properties were thought to be of pre-Roman or early Roman date. Possibly, these sherds were not yet recognised as Late Roman pottery from beyond the Rhine frontier, given that this excavation was carried out before the research of De Paepe and Van Impe (1991) proved this connection. A second option, however, is that these coarse and heavy tempered sherds belong to an earlier phase and show resemblances in provenance and/or technique. In either case, they make an interesting comparison.

The excavation of 1988 in Sint-Martens-Latem also revealed a sunken hut feature with a central pit (LS-88-8-90) containing Late Roman ceramics. Alongside the handmade material, Eifel ware datable to the 4th century was found. One example could be placed as precise as the third quarter of the 4th century. Additionally, a post quem was delivered by a coin of Theodosius (AD 379-395). Although the context could not be date more precisely than AD 350-450, Vermeulen mentions a preference for AD 375-425 (Vermeulen 1989, 71-77).

The finds from Mortsel are very difficult to date, due to bad excavation conditions, and the pottery ranges from the 2nd to the 4th century, with even a 1st century sherd present in the assemblage. Based on the comparisons with the handmade material from Donk, some sherds were identified as Germanic and given a 3rd to 4th century date.

In Zele, samples were collected from contexts ZKH113 and ZKH447, both part of larger structures on the site, in which the Germanic sherds were found in the top filling

associated with 3rd century Roman material (De Clercq and Taayke 2004, 57-71; De Clercq et al 2005, 177-229).

The samples from Knesselare were selected to make the connection with the 3rd century handmade ceramics from Flanders. The contexts relating to the enclosed settlement with palisade were broadly dated from the late 2nd century to the early 4th century, although, in correspondence with the material culture, the predominant phase was placed in the 3rd century. Additionally, two ^{14}C dates place two of the sampled contexts between AD 225-325 and AD 235-325 (De Clercq, Hoorne, Vanhee 2008, 50-53).

The largest amounts of samples derives from the Late Roman fort in Oudenburg. Mainly contexts that could be placed in phase 5 were selected, which is the 4th century stone phase of this military stronghold (Vanhoutte 2007, 217-222). The start of this phase can be placed around AD 325, the end is less evident however. The general accepted date of the abandonment of the regular army forces from northern Gaul in AD 425 is used here as an end date for this phase, although the actual abandonment of the fort can very well be at the end of the 4th century or later in the 5th century. Despite difficult dating circumstances, there are some features with more chronological accuracy from which samples were selected. The first is a water basin, likely a 4th century feature (AD 325-400). Second is the double well, which was constructed in multiple phases ranging from AD 260 to 410. Three dendrochronology's provide this context much credibility. Beside these two contexts, a brooch production waste pit gave the opportunity to select samples from a precise earlier context in the second half of the 3rd century (AD 260-280) (Vanhoutte 2003). In addition, a context from the post-Roman phase 6 was selected as well, although 3rd to 4th century BB1-resembling ceramics were found among the pottery.

The samples from Turnhout - Tijl-en-Nelestraat were also selected for their 3rd century dated structures: houses 7 and 8 (De Smaele et al 2012, 75-77, 106-109, 121). Two samples came from postholes from house 7, which is dated by ^{14}C to AD 220-390 (95.4%) and presented import pottery from the second half of the 2nd century and start of the 3rd century. Seeing the longevity of some imported ware and the absolute dating, a 3rd century date seems very likely. Additionally, three samples were selected from a pit in the interior of house 8, a posthole for a heavy post and a smaller posthole. Radiocarbon dating on the heavy post places it between AD 230 and 390 (95.4%). The house type and it finds are generally dated to the 3rd century, although the ^{14}C date also leaves room for a 4th century occupation.

Most samples collected from the site of Lummen - Meldert - Zelemsebaan were procured from context 597: a feature interpreted as a watering place for livestock based on a funnel shaped transection with peaty material on the bottom and, additionally, the presence of microfossils that occur in open fresh water sources were found as well (Smeets and Steenhoudt 2012, 49, 145-160). Dating by ^{14}C places activities in the 5th and 6th century (AD 400-600 with 95.4% probability, AD 430-540 with 68.2% probability) and dendrochronology supports an early 5th century date on a well. The total range of 6 samples falls between AD 405-422, although the construction of the well is placed in AD 412. Unfortunately there is no ^{14}C dating on S597 due to a malfunction in the preparation of the sample.

The site of Hasselt – Kuringen - Rode Rokstraat is still being processed and only preliminary findings are available. The samples originate from house 2, 3 and 5, which were identified as Wijster AII and B house plans and are dated to the second half of the 4th century and the 5th century.

The most recent excavation from which samples were taken, is Nazareth – Eke – 's Gravendreef, of which the findings are also still being processed. A house plan resembling type Wijster A revealed a few sherds with apparent Germanic properties. One of these was submitted to ^{14}C dating on the food residue on the interior and the sooth on the exterior of the sherd (Figure 27). The food residue resulted in a 2nd to 4th century date (AD 120-330 with 95% probability, AD 130-260 with 68.2% probability), the sooth resulted in a 3rd to 4th century date (AD 220-390 with 95% probability, AD 245-335 with 68.2% probability) and the combined result gave a date of AD 210-340 with 91.7% probability and 280-325 AD with 41% probability (Pers. Communication T. Dyselinck).

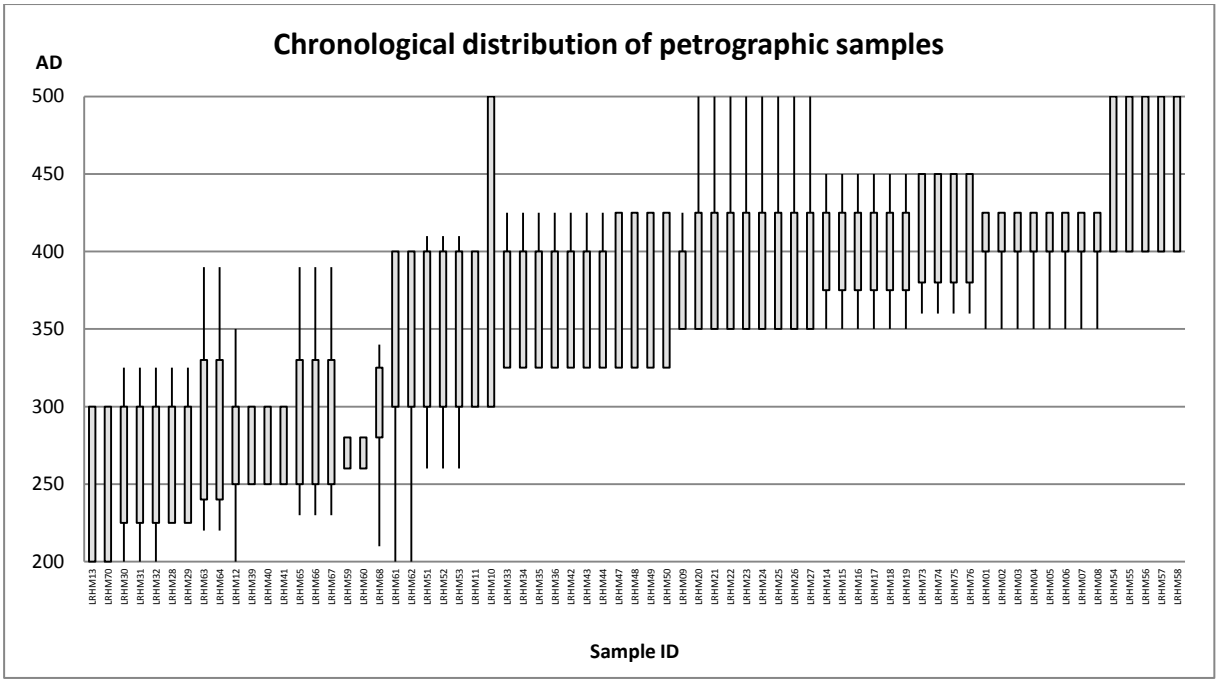


Figure 71 Chronological spread of each datable context visualised per sample. The boxes are the preferential dates from either the excavators, original study or interpretation from the author. The whiskers represent the entire range of the context dates. For context details and dates, see Appendix 2.

6.4.3.2 Petrography vs. chronology

When the petrographic classes are cross-referenced with the chronological distribution, some minor observations can be made. First of all, the sedimentary class is present throughout the 3rd to the 5th century, consistent with the local nature of the clay. Second, the non-local classes can be divided in two groups. The volcanic class is already present in the 3rd century, whereas the plutonic and metamorphic classes are only found from the 4th century onward and remain until the latest 5th century contexts.. Furthermore, the uncertain sedimentary/metamorphic class does not alter the image for class M. The chronological limitation for classes P and M can partially be explained by the bias of identifying rock tempered sherds as Germanic and thus placing them only in the (late) 4th and 5th century. However, the distinction between volcanic and plutonic or metamorphic rock cannot be made without petrographic observation, implying that the 3rd century examples with volcanic inclusions represent a different technological origin. Moreover, the provenance region for these two groups differs as well. This matter arises the hypothesis if these pots represent people immigrating from different regions or if a better explanation is sought in aspects of an economic network. Perhaps the volcanic element is connected to the trade or supply of stones from the Eifel region.

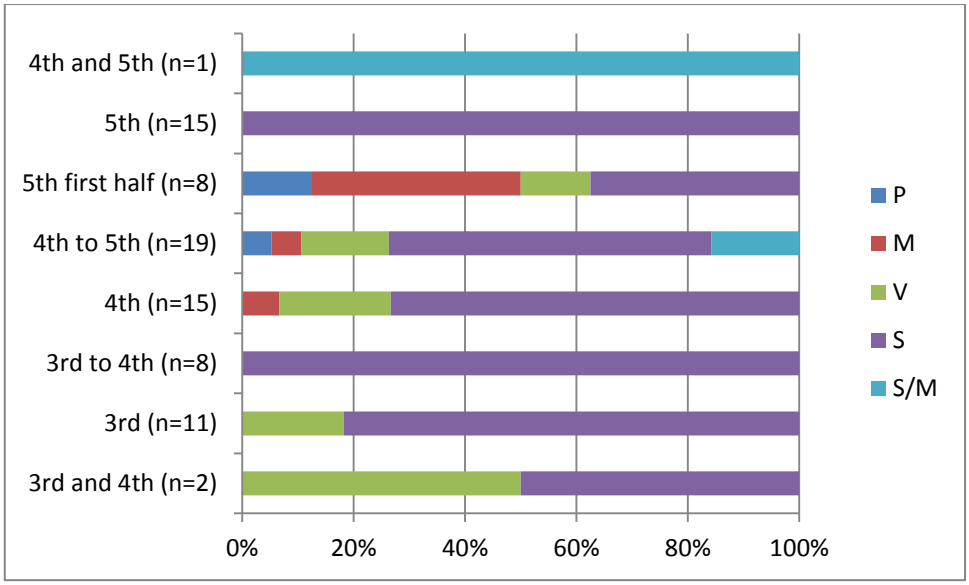


Figure 72 Geological classes plotted according most frequent date ranges of the examined contexts from the 3rd to the 5th century.

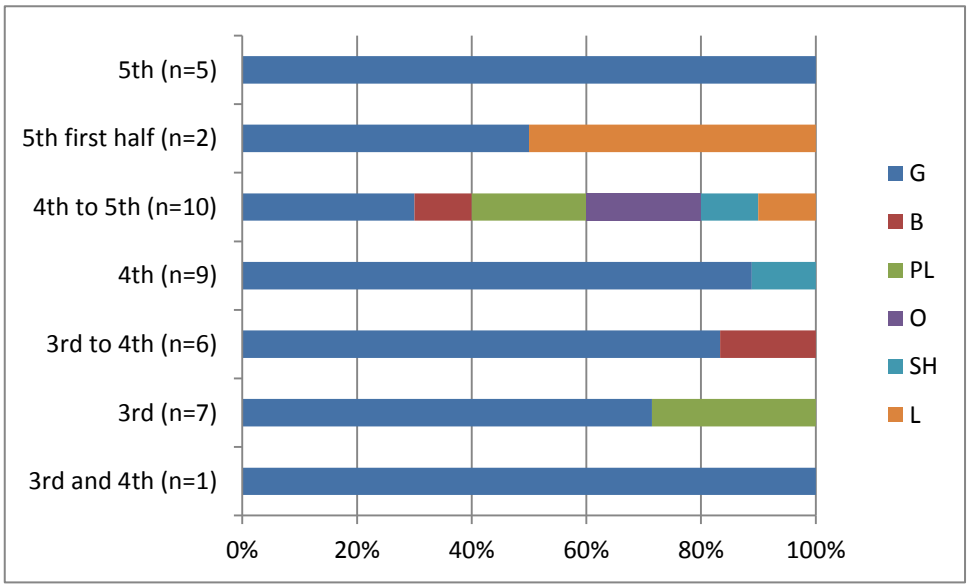


Figure 73 Temper classes plotted according most frequent date ranges of the examined contexts from the 3rd to the 5th century.

The chronology of the temper gives less information, due to the small number of samples that are tempered differently from grog. The grog-tempered ware is consistent with the local tradition from the Early Roman period and continues on into the youngest 5th century contexts. Additionally, the bone temper appears to be introduced in the 4th century, consistent with the lack of examples from the early Roman period in the Menapian area (De Clercq 2009). Furthermore, the samples with plant, slag, shell and lithics are too few in numbers to come to any chronological conclusions, although their lack in the 3rd century samples suggests that these tempers also were new introductions

in the rural landscape. Whether this is an technological introduction by other people or a local innovation as the result of the need for increased quantities of handmade pottery is unclear, although not much evidence supports the latter at this point.

6.5 Characterisation of Late Roman handmade pottery in Northern Gaul

6.5.1 Local continuity and non-local influence: tradition and innovation in Late Roman handmade pottery

The total fabric variety for the handmade ceramics changes over time in northern Gaul. There is not enough petrographic consistency for each region and site with Late Roman ceramics to present definite statements on the change over time for northern Gaul in its totality. Especially the direct frontier zone deserves more attention in order to understand the consequence of long term interaction between (provincial) Roman people, soldiers and Germanic communities. The collection of comparative data here, does allow us to focus on the rural Roman hinterland area of present day Flanders.

6.5.1.1 Fabrics from sedimentary sources

Preceding the Late Roman period, three major fabric groups were assigned to the handmade pottery of the Menapian area (De Clercq 2009, 412-414). The first group consisted of quartz-rich clays without additional significant or consequent mineralogical properties ('*Sq*'). Similarly, the second group comprised of mainly quartz, but with glauconite as a significant constituent ('*Sgl*'/'*Sqgl*'). The third group deviated from the other two by the significant presence of muscovite ('*Sqmu*'). All three groups contained sherds tempered with grog, plant and coarse quartz grains. Only the muscovite group additionally contained fragments of iron oxyhydroxide concretions (*ijzeroer* in Dutch laymen terms). These groups are all considered local products for the western part of Flanders (roughly corresponding to provinces West- and East-Flanders and the Dutch Zeeland area).

Arguably, all these groups can be described within class S and additional mineralogical codes q-gl-mu, with additions of g-pl-fe as temper indications. Depending on the abundance of the temper presence, the sherd can be placed in a temper class rather than in class S. When compared to the current dataset (Figure 74) we see that approximately a quarter of the samples have no added temper and consist primarily out of sedimentary quartz (sq) sometimes deriving from calcareous or iron rich clays (Sqca – Sqfe). Also potentially natural clays could contain shell and plant fragments, although the plant suffix has not been added when the plant material was not abundantly present. In contrast, the shell code has been added to the descriptions on every occurrence, given its rarity and its potential provenance capacity. In all, the fabrics with shell inclusions (Sshq/Sqsh) here represent either an added temper or are naturally tempered, in which case the potter was most likely aware of it and choose the clay intentionally.

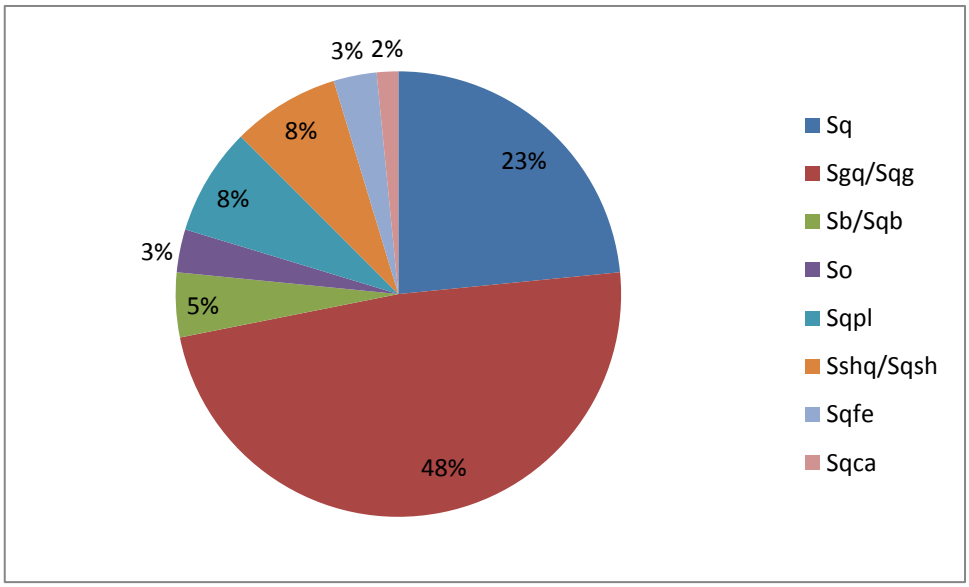


Figure 74 Pie chart representing a total of 64 LRHM samples with only sedimentary indications.

This means that a little less than three quarters of the samples are tempered wares, with either grog (Sgq/Sqg), bone (Sb/Sqb), slag (Sqo), plant (Sqpl) or shells (Sshq/Sqsh). From the comparison with the earlier Roman fabrics, we can place the grog and plant temper in the local traditions that most likely were continued on throughout the entire Roman period in Flanders. Their presence in more than half of the sample population, supports this. Together with the non-tempered clays, this means that three quarters of the samples in the sedimentary class can be considered local products tied to tradition and continuity, possible on a domestic scale or small localised productions: a short source-to-site distance as mentioned by De Paepe and Van Impe (1991, 167).

However, this also means that a quarter of the samples cannot be accounted for in the continuing local tradition. The obvious question poses itself: does this imply local innovation, with or without influence of external factors (i.e. Germanic migrants or 'warrior bands' or Roman soldiers), or do these fabrics represent 2nd generation ceramics from immigrants, who use a technique from their own traditional sphere, but only had local clays and materials available?

Unfortunately, the bone, slag and shell are too few in numbers to receive a clear image from their distribution and contexts. However, given the active search for 'Germanic' material in this study and even more so in the comparative material, the limited number of finds argue in favour of 2nd generation material. If this was a local innovation starting in the 4th century, we would expect to see a larger number of sherds showing up in the sample population, especially since these ceramics have almost always been, right- or wrongfully, classified as 'Germanic' in previous excavations and research.

Nevertheless, the distribution image from the bone and shell temper is limited as best and cannot confirm or deny any hypothesis at this point. For now, the pattern emerging for the bone temper is an association with mainly sedimentary clays and only in once case with a metamorphic source, spread in the wider river area along the Lower Rhine, i.e. the frontier zone. No comparative sherd was found containing bone further north. The samples found in the hinterland south of the frontier, might be from interactions with the frontier communities around the Lower Rhine or with the military presence in this area. An additional possibility is the migration away from the frontier zone by some families looking for arable land. To which extent these families would have a Germanic, Roman or hybrid identity is not possible to state upon without considering the full material culture found in association with these bone tempered ware.

The final, and most rare, temper is the slag temper in which metal ores or waste have been added to the ceramics. Only two samples are known from Sint-Martens-Latem and Neerharen-Rekem, another sherd from Oudenburg possibly contains slag-temper, but this is not quite sure at the moment. Neerharen-Rekem has confirmed metal working activities on the site, associated with some sunken huts on the site. The sherd from Sint-Martens-Latem was found in the fill of a sunken hut, and might as well indicate metallurgy activities on the site. Both sites are interpreted to house Germanic immigrants, supporting the notion that this is a non-local technique. Unfortunately, again we have no comparative material from north of the Rhine. Potentially, the explanation behind this temper does not have to be sought in a cultural sphere, but as the

result of a technological trait, associated with small-scaled metal production in a rural setting, i.e. when slag was available as metal waste, it was used to temper the locally produced ceramics. However, the lack of slag temper on earlier Roman or non-Germanic sites can be seen as an argument against this, although this could be the result of the recycling attitude in Roman metallurgy. Which in its turn, argues against the use of slag on a site with more than incidental domestic metal production, where as much metal as possible was reused. Unless these tempers represent metal waste beyond the capacity of useful recycling. In all, we can conclude that much more research is needed before a conclusion can be drawn for the slag tempered handmade pottery.

An additional consideration we have to make here, is the widely accepted premise that immigrated Germanic families replaced their traditional rock temper with anything they could find to make the clay coarser. This explanation would make the bone and slag temper, and to some extent the shell and grog as well, a potential innovation from first generation Germanic migrants when they were confronted with the absence of a key-ingredient in their traditional ceramic production technique. From the point of Late Roman Flanders, this would make a local innovation by non-local influence.

6.5.1.2 Fabrics with plutonic, metamorphic and volcanic sources

The fabrics containing non-plastics from plutonic, metamorphic and volcanic source have always been considered non-local material for the research area within the Roman borders, simply because they do not occur in the geological landscape of Flanders, southern Netherlands and northern France. This is correct and indeed points to influence from other regions such as the north of the Netherlands and Germany with glacier deposits and the Eifel region with volcanic sediments. However, the in the last two or three decades it has become apparent that we cannot simply connect a provenance to an ethnic or cultural identity (see Chapter 2). So in order to confirm or expand the notion that non-local fabrics or elements represent Germanic immigrants in the Late Roman period, we will review the plutonic, metamorphic and volcanic class in the same manner as the sedimentary.

The current dataset uncovered 27 samples containing elements not indigenous to the geology for the area of Flanders and the southern Netherlands. The plutonic class has been divided into two groups based on the nature of the feldspar. P2 is further subdivided into three subgroups depending on the association with muscovite, biotite or both (see classification). The group P1 with red feldspars, has not been encountered in the samples.

The plutonic class represents the smallest non-local group in the complete spectrum. The metamorphic class is somewhat more present in the material, mainly containing non-plastics derived from low grade metamorphic rocks. No explicit example for high metamorphism has been encountered in the samples. Among this class is a group of samples where it is not clear whether the inclusions derive solely from a sedimentary source, or also contains elements from a metamorphic source. Since the sedimentary class is defined as consisting of samples with only sedimentary derivatives, these uncertain fabrics were classified as S/M throughout and are now considered as a potential extension of the metamorphic class. Combining both the MLG group and the S/M group, the sherds containing metamorphic debris make up approximately 40% of the non-local samples. One sample with heavy bone temper has been found to contain quartz deriving from a metamorphic origin (Bmq) and is also regarded as part of the metamorphic class. Thirdly, the volcanic class contains the largest group of samples. This class has been divided into three groups mainly depending on the quantity of volcanic non-plastics in the sample (see classification). In general, a lesser amount of volcanic inclusions appears more frequent than an abundant presence. Noteworthy is that all samples containing volcanic fragments, also exhibit quartz and sometimes calcite deriving from a sedimentary source. This combination might indicate a sedimentary source area containing a river that originates or runs through a volcanic source (Pers. Communication E. Goemaere).

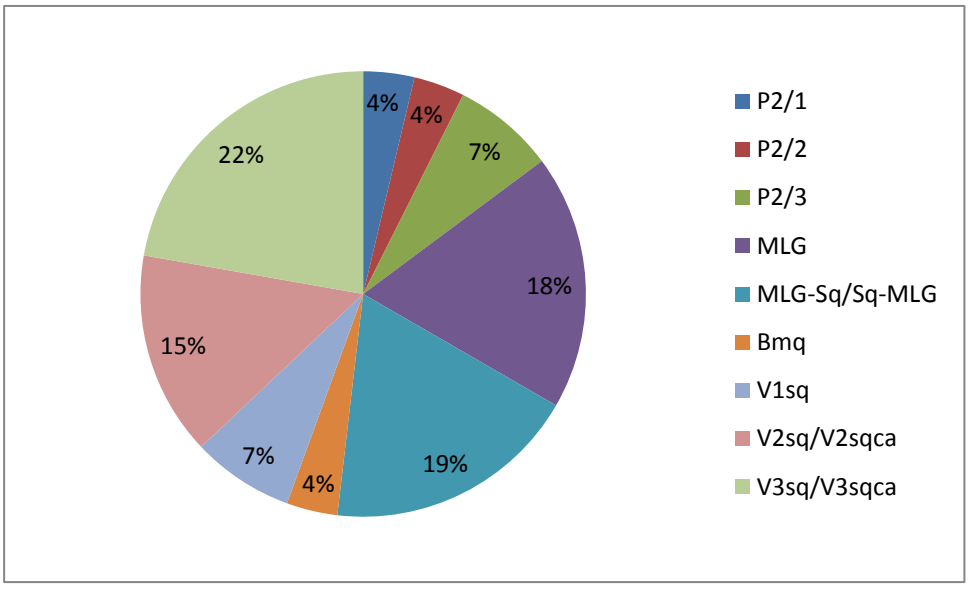


Figure 75 Pie chart representing a total of 27 samples with plutonic, metamorphic or volcanic indications.

The plutonic and metamorphic class were combined in the group A from De Paepe-Van Impe, making it difficult to pick up on the different patterns between these two classes. Both appear to arrive mainly in the second part of the 4th century and the beginning of the 5th century, although this can be biased by role of the identification of these wares in dating Late Roman contexts. The only exception in this sample population is one of the two sherds from Neerharen-Rekem thought to be Iron Age or Early Roman. This sherd belongs in the S/M group and cannot be confidently used to argue a case for the chronology of the metamorphic class. The possibility that the sherd was not recognised and is indeed a Late Roman sherd remains an option. No distinction in the distribution can be made on an interregional scale, although most sherds with a MLG fabric appear in the east of Flanders in Hasselt, Lummen, Neerharen-Rekem and one additional sherd from Oudenburg. Only one case from the Netherlands is present in our sample population from Beneden-Leeuwen and consists of the heavy bone tempered sherd (Bqm). Additionally, no plutonic inclusions were identified in the French samples, implying that the distribution of metamorphic fabrics reached further southwest than the plutonica. Furthermore, both classes share a lack in additional temper besides rocks, something they have in common with the volcanic class as well. Differences or similarities on a larger scale will only be possible when the distinction between plutonic and metamorphic sources is made for each sample belonging to Group A. For now, we will consider them together in comparison with the other classes.

The distinction with the volcanic class is easier to spot. The first interesting pattern that emerges is the more limited distribution of the volcanic fabrics. Not only in comparison with the P/M classes, but also compared to the sedimentary class (Figure 66). The volcanic sherds appear to be limited to northern Gaul, only in and south of the Dutch river area, i.e. within the borders of the Roman Empire and the frontier zone. Similar to the distribution of the bone and grog temper. The plutonic-metamorphic and sedimentary samples cross this border into the northern Netherlands and northwest Germany. Moreover, there is a chronological distinction. Volcanic fragments have been found in samples from 3rd century contexts from Zele and Oudenburg. Additionally, one of the two sherds from Neerharen-Rekem identified as potential Iron Age or Early Roman sherds also contains volcanic debris. Potentially, the sherd from Mortsel can also be placed earlier, since the dating of the whole context is unsecure and is largely based on the presence of Germanic sherds to date it to the 4th and 5th century. A final distinction is made when we consider the plutonic and metamorphic samples without the sherds from

Germany and the northern Netherlands, i.e. inside the Roman Empire, a little less than 40 examples remain from 19 sites. To this, the volcanic group comes close with almost 30 samples also from 19 different sites.

From this new evidence comes the indication that not all sherds with a non-local source area can be viewed as similar and be explained by the same mechanism of migrating Germanic people in the 4th and 5th century. This is only logical, considering that the source area for these two groups is not the same. The origin of the plutonic and metamorphic rocks is mainly sought in the glacier deposits in northern Netherlands and Germany, whereas the volcanic rocks have been traced back to potential areas in the Eifel region. Given the differences in chronology and distribution, it can be argued that we need at least two different explanations. The traditional explanation for the P-M classes is the immigration of Germanic people from north of the Rhine, preferably at the end of the 4th century and the beginning of the 5th century. At this point, all the evidence seems to support that conclusion. Even with circular reasoning present in the dating of these sherds and their contexts, the chronology holds up with new evidence from new sites which are dated and examined by other analyses as well, such as the numismatic re-evaluation of Neerharen-Rekem and the ^{14}C of Lummen.

The explanation for the presence of the V class/Group B has been very shallow and as a non-indigenous element has piggy-backed on the migration narrative for classes P-M/Group A. Due to the small presence in the study of De Paepe and Van Impe, it was not widely considered besides identifying a potential provenance, although for Virton it was noted this sherd containing volcanic material does not necessarily have to be tied to migration, since Virton is located in the proximity of the Eifel region (De Paepe and Van Impe 1991, 171). Bouquillon, Tuffreau-Libre and Leclaire also believed this material to be tied to migration or reorganisation of peoples from the east (1994, 233-234). Although, the resemblance between the volcanic rock inclusions and the basaltic lava expressed in the French study poses the option of the moving of goods, or more precisely stone. It is known that stone was introduced in the stoneless landscape of Flanders during the Roman time, such as basalt from the Eifel region. It is not unthinkable that these stones or part of them could have ended up as temper in pots in a society where it was necessary to temper the local fine clays, preferably with grog. Additionally, it has to be mentioned, especially since the import of Eifel ware is common in the Late Roman period, the long distance trade of these vessels is also an option, although this is widely contested for handmade pottery. The connection to the Roman economic network for stones with the

Eifel region seems more likely. A final possibility is not the migration of anonymous Germanic people from the east, but the movement of military troops - be they Roman, Germanic or mixed in nature – responding on the need for a military presence in the north of Gaul on multiple occasions in the 3rd and 4th centuries. Much more comparative work with the regions adjacent to northern Gaul inside and outside the Roman Empire are needed to propose a valid conclusion.

To conclude here, for the viewpoint of Flanders, we can call the presence of plutonic, metamorphic and volcanic elements in the handmade ceramics a new non-local tradition into the handmade pottery spectrum for the Late Roman period. Two different patterns emerged from the compiled evidence, suggesting a movement of people or goods (stones) from the Eifel region, moving northwest, which started earlier in the 3rd century, and a second migration of people north of the Rhine, moving southwest, which started most likely in the second half of the 4th century. This non-local tradition, however, was destined to be short lived, since the migrated people were cut off from the original source for their traditional temper and had to look for new solutions to make traditional pots with the local fine clays. These new tempers can consist of copying the local traditions, such as the use of grog and plant matter, but can also explain the insurgence of new and rare tempering techniques, such as the use of bone, slag and shells, resulting in a non-local innovation. In the curious case of the bone temper, this could explain the distribution pattern which appears to remain within the boundaries of the Roman Empire, or more likely, within the strictly sedimentary geological region of the Low Countries. More importantly, if these hypotheses proof correct, this would signify that, within the region consisting of solely sedimentary clays in northern Gaul, the presence of handmade pottery containing plutonic and metamorphic non-plastics can be regarded as first generation immigration material. Furthermore, these first generation ceramics could help date new settlements quite accurately, since the lifespan of these ceramics is considerably short. Moreover, the bone and slag temper can be expression of second generation material culture as a compensation for the loss of access to rocks as a natural or added temper. Finally, this also indicates that the 'Germanic' forms in local fabrics can be seen as either a second generation pot, or as a result of a hybridisation in a mixed society. To make the distinction will depend on the context in which the pottery is found.

6.5.2 Contextualising Late Roman handmade pottery characteristics

From the new evidence collected in this study and the comparison with the larger interregional dataset, it has become clear that the historical and archaeological context of the Late Roman handmade pottery is more complex than it is given credit. In order to work towards an identification of this ware from an informed and contextualised point of view, we will go through the characteristics encountered in this study and connect them with their overall conclusion.

The most frequently encountered sherds in this study contained a fabric of clay deriving solely from a sedimentary source, mainly tempered although non-tempered wares did occur as well. These sherds have often been neglected, due to their local production nature. However, we have shown that an appreciation of the local traditions provides us with a comparative base line in order to investigate innovation, external influence and change through time. The fabrics that are mainly described as 'Sq', 'Sg' or 'Spl' can be considered fabrics tied to local traditional wares, implying a continued indigenous production in the rural hinterland of northern Gaul. The slightly deviating wares with large rounded monocrystalline quartz grains, can be most likely tied to fluvial sediments for the origin of the clay. Based on fabric alone, the sherds from this sedimentary class will be difficult to date without context or indications towards form and decoration. They are, however, present and dominant in the 4th and 5th century as well and should not be regarded as Early Roman handmade pottery when they lack 'Germanic' traits.

The non-local wares comprise of plutonic, metamorphic and volcanic elements. The combination of plutonic and metamorphic debris has not been encountered, implying that a separation of these classes is the right approach forward into understanding their presence in a sedimentary landscape. Sherds with plutonic or metamorphic elements can be considered as a connection with areas north of the Rhine. The fabric derives most likely from clays within glacial deposits. The compiled evidence suggests that we can tie these pots to people migrating or moving south from across the Rhine. Although, this evidence is tangible, we should remain cautious in directly connecting pots to people. The results delivered here, explain a mobility of single families or even individuals, moving from outside to inside the Roman Empire. To determine if this was in search for arable land, for a different life in a structured state or for employment in the Roman army will have to be established by the nature of the site. These fabrics appear to have been

introduced mostly in the second half of the 4th century and the start of the 5th century. The chronology and interpretation of this ware has to be made in association with other (Late Roman) material, since an appearance in late 5th or 6th contexts has to be interpreted in a different sociocultural setting.

Additionally, an alternative explanation has to be considered for the presence of sole metamorphic mineralogy, or in combination with volcanic and/or sedimentary inclusions. The occurrence of ceramic material containing these elements could also point to fluvial sediments as a clay source. More specifically, from a river that has passed through or originates in a metamorphic and/or volcanic landscape. This means that the presence of metamorphic debris cannot directly be taken as proof of migration in the same way as the plutonic material, since multiple provenance locations are tied to these river criteria.

The smallest, yet earliest, non-local ware contains volcanic rocks in differing quantities and often associated with sedimentary minerals as well. This group of fabrics represents people or goods moving northwest from the Eifel region. In the case of movement of people, it is not clear whether these are Roman or Germanic people from rural or civilian communities or soldiers. The movement of goods is also valid here, given the existence of the economic network with the Eifel region and the trade in stone into our region. To date these fabrics, it is necessary to use the associated material culture as well, since they occur from the 3rd century onward into the 5th century.

Finally, the most complicated and interesting implications, pertain to the new tempering techniques present in the sedimentary class. Bone temper is most occurring in the Lower Rhine area and appears to favour a distribution inside the frontier zone and the Roman Empire. The slag temper is very rare and potentially only present on sites with metal production. Shell temper is also a new feature and appears to have a provenance in the coastal plains, however, the distribution pattern shows multiple sites further inland. All these tempers have not yet been found in contexts predating the 4th century, indicating their Late Roman character. The numbers of finds are still very limited, possibly connected with their recognisability as Late Roman or because they are the result of a hybridisation product, i.e. 2nd generation material. In this case, the fine sedimentary clays from the southern Netherlands, Flanders and northern France lacked the coarseness wanted by the immigrants, either tied to sociocultural or technological traditions, needed to be tempered. They probably copied the indigenous technique of grog and plant temper, but additionally sought refuge in other temper sources as well.

This hypothesis, of course, needs much more study before definitive statements can be made.

In general, we can conclude that the petrographic analyses of handmade pottery for the 4th and 5th century present in the Low Countries provides an excellent tool to investigate matters of local continuity, migration, tradition, innovation and hybridisation in the rural landscape of northern Gaul.

7

Late Roman terra nigra foot-vessels: "a Germanic idea in a Roman body?"

The content of this chapter is based and elaborated on a publication that will be submitted to ***Archäologisches Korrespondenzblatt***

Van Thienen, Agricola, Stilborg, Heeren. Characterising terra nigra foot-vessels of the Late Roman period from Germany, the Netherlands and Belgium (in prep).[17]

In this chapter the case study of the Late Roman terra nigra foot-vessels is presented. Due to some obscurity surrounding the typology of this ceramic group, we will start with a brief overview of the research history relevant to the foot-vessels that are dealt with in this study. To further clarify which type of foot-vessels were analysed, the typology for the Chenet 342 and Gellep 273/274 is given and complemented by the latest knowledge of its distribution. Two types of ceramic analyses have been carrie out. In this chapter the focus is placed on the Dutch-Belgian material and is therefore centred around the petrographic analysis. The German samples provide a comparison for the petrography and fabrics, as well as deliveer geochemical data to investigate matters of production, technology and provenance. Finally, the signficance of the results provided by the

[17] This chapter is based on the joined research behind the article but contains added sections and elaborations on the pottery from Belgium and the Netherlands in order to maintain the focus and optimise the contribution for the research area of this dissertation. The article is expected to be submitted in July to Archäologisches Korrespondenzblatt (AK).

ceramic analyses, typology and distribution will be discussed in order to gain some understanding in the development and sociocultural context of these foot-vessels.

7.1 Introduction

In the northwest frontier regions of the Roman Empire, grey to black wheel-thrown pottery is frequently found in the Late Roman period (4th and 5th century AD). Some scholars assumed a provincial-Roman origin for these terra nigra-like vessels, while others have asserted a Germanic provenance of the production. One reason why different authors ascribe production of this pottery to various regions is that the group as a whole is not defined clearly. The name of terra nigra might imply a connection to the fine wares of the earlier Roman Empire, but in fact the variety in quality is considerable. Some of the specimens would better fit a classification as plain wares, and even handmade pottery is sometimes assigned to this group. To avoid confusion with the earlier fine terra nigra, although yet to maintain the embedded name for this pottery group, the term of 'Late Roman terra nigra' will be used consequently in this article to refer to wheel-thrown grey to black pottery from the 4th and 5th century AD.

7.1.1 Past research

In 1941 Chenet published his famous work on the terra sigillata of the 4th century, produced in the Argonne region in northern France. Although the book was about the red-fired (oxidising) terra sigillata, it is explicitly stated that form 342, characterised by a high hollow foot and a more or less S-shaped outward curving rim, also occurred in reduced firing technique with a grey colour. Chenet noted the similarity of his form 342 with handmade vessels of the Rhine-Weser-Germanic pottery and presumed some relation with 'Germanic invasions', although he maintained that the vessels he described represented a provincial-Roman production (Chenet 1941, 91-92).

Van Es published the Germanic site of Wijster, north of the Rhine, in 1967 (van Es 1967). Some 150 sherds belonging to the larger group of Late Roman terra nigra vessels were found here. He distinguished two groups: a Germanic group of funnel-like high vessels

and a Roman group similar to Chenet 342. Referring to Chenet, Van Es assumed a Roman origin of this material, treating the Late Roman terra nigra vessels as imports (Van Es 1967, 158-168). Soon after, Schoppa (1970b; a) described two assemblages (Castrop-Rauxel 'Erin' and Kamen-Westick) and in addition to the Chenet 342 vessels he also found diverging forms. Mildenberger worked in North-Hesse and compared the finds with the terra nigra of the so-called Hellweg area east of the Rhine between the rivers Lippe and Ruhr, and found more sites and relatively high numbers of Late Roman terra nigra vessels. Many of these vessels were executed in a white or light grey fabric with a darker grey surface, and this fabric was called the Hellwegware by Mildenberger (1972).

The second volume of the now famous cemetery of Krefeld-Gellep contained two graves each with a vessel on a high foot, executed in a blue-grey fabric (Gellep 273 and 274). Pirling posed the question of provenance of this pottery without answering it, and supposed that this form of vessel played a role in the development of Merovingian biconical pots. No reference to type Chenet 342 is made (Pirling 1974, 56-57, Typentafel 5). However, Pirling related another vessel, Gellep form 252, to the Chenet forms because these vessels had a polished black smoked surface covering the body of the sherd (Pirling and Siepen 2006, 188). Although the fabric of Gellep 252 was seen as similar as that of the Chenet 342, the flat base of Gellep 252 did not conform to the high foot of Chenet 342 (Pirling 1974, 42-43, Typentafel 2).

In the early 1990s a settlement was excavated not far from Van Es' Wijster, called Raalte-Heeten. Forms resembling Chenet 342 were found in a wide variety of fabrics, from lustrous glosses to plain wares. The forms ranged from vessels on a high foot to flat-bottomed vessels. The high numbers and some assumed misfired bowls led to the hypothesis that some of the vessels were produced here (Erdrich 1998). A few years later another probable production site, Colmschate-Skibaan (municipality of Deventer) was published by Hermsen, who also produced a new distribution maps (Hermsen and Bartels 2007, 130).

Pirling's careful distinction between forms and fabrics (Chenet 342 and Gellep 252 in fabrics with a complete black surface and Gellep 273/274 in plain blue-grey ware) was not followed by the more recent researchers. Chenet 342 and Gellep 273 are used interchangeably and often either one of these is used as a *pars pro toto* for the complete group of grey vessels (Erdrich 1998; Hermsen and Bartels 2007; Lanting and Van der Plicht 2010, 99-101). When studying the site of Wijk bij Duurstede-De Geer, Heeren observed that certain typological features coincided with fabrics. The foot-vessels were divided based

on differences in foot-shapes which revealed a correlation between form and fabric. The foot characterising for Gellep 273 presented itself in a pale fabric with smooth grey surface, while the massive foot are either brown, black or approach a handmade appearance. The high hollow foot cf. Chenet 342 occurred in various grey fabrics from plain and quite coarse to dark pottery (Heeren, in prep). Late Roman terra nigra with a dark or brown gloss, assumedly from the Argonne area, is absent from the Wijk bij Duurstede site but present at Gennep (Heidinga and Offenberg 1992, for a preliminary site report; Verhoeven 2003, for the pottery and).

The production site that Erdrich studied, Raalte, is situated outside the Roman Empire, just north of the limes. This was the reason for Erdrich to declare the group as a whole to be a Frankish-Salian artefact, since historical sources place the Salian Franks in this area (Erdrich 1998). Following Erdrich, Lanting and Van der Plicht approach the terra nigra very one-dimensional. All terra nigra groups, from the Early Principate until the Merovingian biconical pots, are treated as one cultural style and declared to be of Frankish origin. The production on provincial-Roman soil are thought to have produced this type of pottery for the tastes of the Frankish auxiliary units of the Late Roman army (Lanting and Van der Plicht 2009/2010, 99-101).

The most recent extensive publication concerning Late Roman terra nigra vessels is by Hegewisch. His aim was to study the knowledge transfer and adoption of pottery techniques using the fast wheel outside the Roman Empire, and therefore most of the attention was focused at the Germanic area. Hegewisch carefully separated the various form traditions and fabrics (Hegewisch 2011). For the group of vessels on a high foot like Chenet 342 and Gellep 273 he notes the recent trend of interpretation as Germanic forms just like it has been described here, but does not yet discard the option that this pottery group was actually produced in the Argonne area (Hegewisch 2011, 161-164).

In the review delivered above, we have illustrated the common problem of using different parameters to classify the same pottery group, making it very difficult to compare results of multiple studies. Furthermore, the regionality and separate use of different typologies causes a problematic insufficient knowledge of the distinction and/or overlap, resulting in obscurity when reviewing the literature. Overall, the Chenet identification is heavily set in the French literature and the Gellep types occur most in German literature. Belgium has favoured the French parallels, whereas the Netherlands have used both typologies. Additionally, the different and incoherent fabric definition

used by different authors and the absence of an objective and general definition of the term 'terra nigra' complicated the matter even further.

The aim of this chapter is first to deal with the classification issues and typological obscurity concerning the form and fabric of this pottery type and the resulting reflection on its distribution, second to investigate its production nature based on geochemical and petrographic characteristics, and third to explore new avenues of interpretation regarding the significance of the foot-vessel in the Late Roman period in Northern Gaul and the adjacent regions in Free Germania.

7.2 Typology and distribution

7.2.1 Typology of Chenet 342

As mentioned in the introduction, the Chenet 342 type was established by Chenet (1941) in his study of the Argonne pottery from the 4th century. The 342-form is described as a cup with an outward curving rim on a conical or cylindrical hollow foot, fired in either oxidised or reduced atmosphere. Here we will focus solely on the Late Roman terra nigra vessels, i.e. in reduced firing conditions. The rim and shoulder of this shape are fairly consistent, with small variations on the same type of rim. The foot, however, can occur in a variety of types, both hollow and solid. The most frequent foot shape for the Chenet 342 vessels in the study area is the cylindrical hollow foot with slight (1a), medium (1b) or high (1c) elevation. Additionally, a conical to cylindrical massive foot (2) and a cylindrical to square hollow and flat foot occur in lesser numbers. The exterior finishing varies much with grooves, lines or smooth surfaces, although no roulette, awl or impression motifs have been encountered, besides one rim sherd known from Neerharen-Rekem (BE) (Stroobants 2013, 75).

Figure 76 Variation in rim types for the Chenet 342 from Belgium and the Netherlands (scale 1:3).

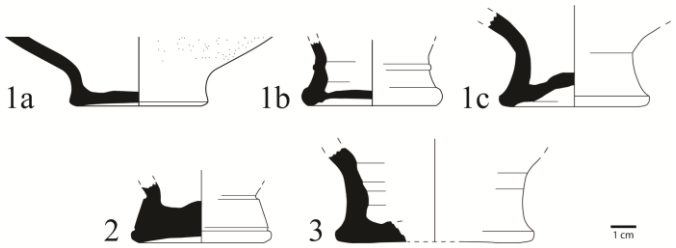


Figure 77 Variation in foot types for the Chenet 342 from Belgium and the Netherlands (scale 1:3).

Furthermore, a chronological evolution in the general form was established in the region of Pas-de-Calais (northern France) (Seillier 1991). They noticed that the earliest vessels have a variable width and the height is equal or slightly smaller than the diameter of the rim. Additionally, these Chenet 342a vessels are mostly undecorated, save from grooves and lines, with either a high massif or hollow foot. This subtype is found to be similar to the Argonne vessels and is dated from burials in Vron (FR) to 370-435/445 AD. The 342b variant is much larger in diameter than in height, and inclines more towards a bowl than a cup. These vessels again are sparsely decorated and have either a hollow or massif foot, although not so high as the 342a. Based on the burials, the 342b is dated to 435/445-450/460 AD and can potentially be a predecessor to later Merovingian vessels (Seillier 1991, 62-70).

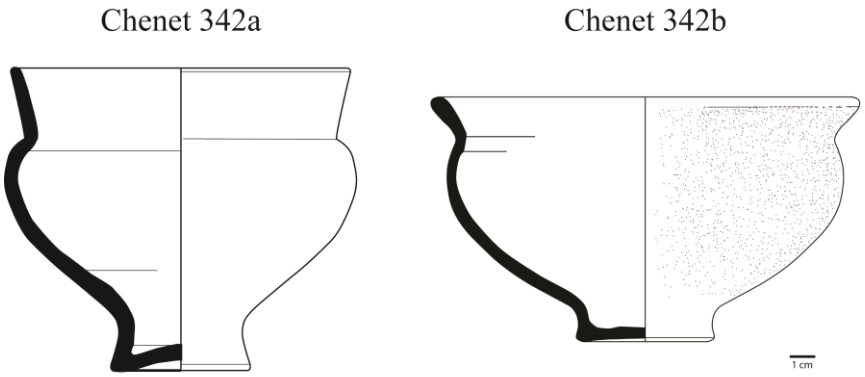


Figure 78 Examples of Late Roman terra nigra foot-vessels Chenet 342a (1) and Chenet 342b (2). – (Drawing J. Angenon). – Scale 1:3.

In general, the Chenet 342 vessel is frequently found in burials in northwest Gaul for the 4th and 5th century (ca. 350-450 AD), although the more recent finds from Belgium and the Netherlands also often derive from contexts associated with settlement depositions and water such as wells, basins, ditches and pits. Evidence of localised production is only known from Lavoye in association with a kiln and a burial dated around 360 AD (Chenet, 1941, 92). A production in the Argonne area is often assumed, but lacks evidence.

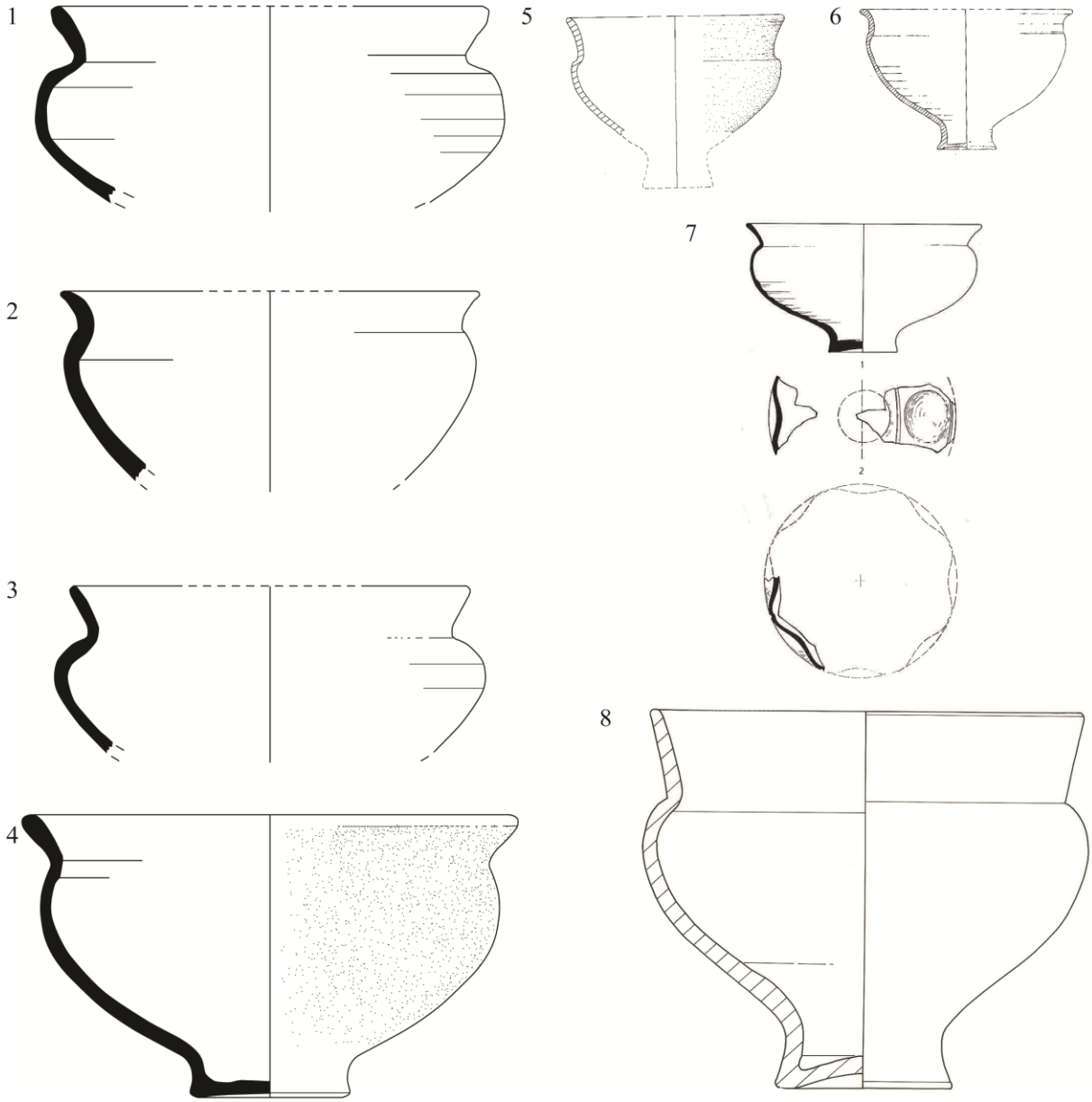


Figure 79 Most complete sampled foot-vessels of type Chenet 342 from Belgium: 1-4. Meldert, 5. Asper, 6. Kruishoutem, 7. Temse, 8. Tongeren (1-4 drawings are scale 1:3 (J. Angenon), 4-8 are various scales).

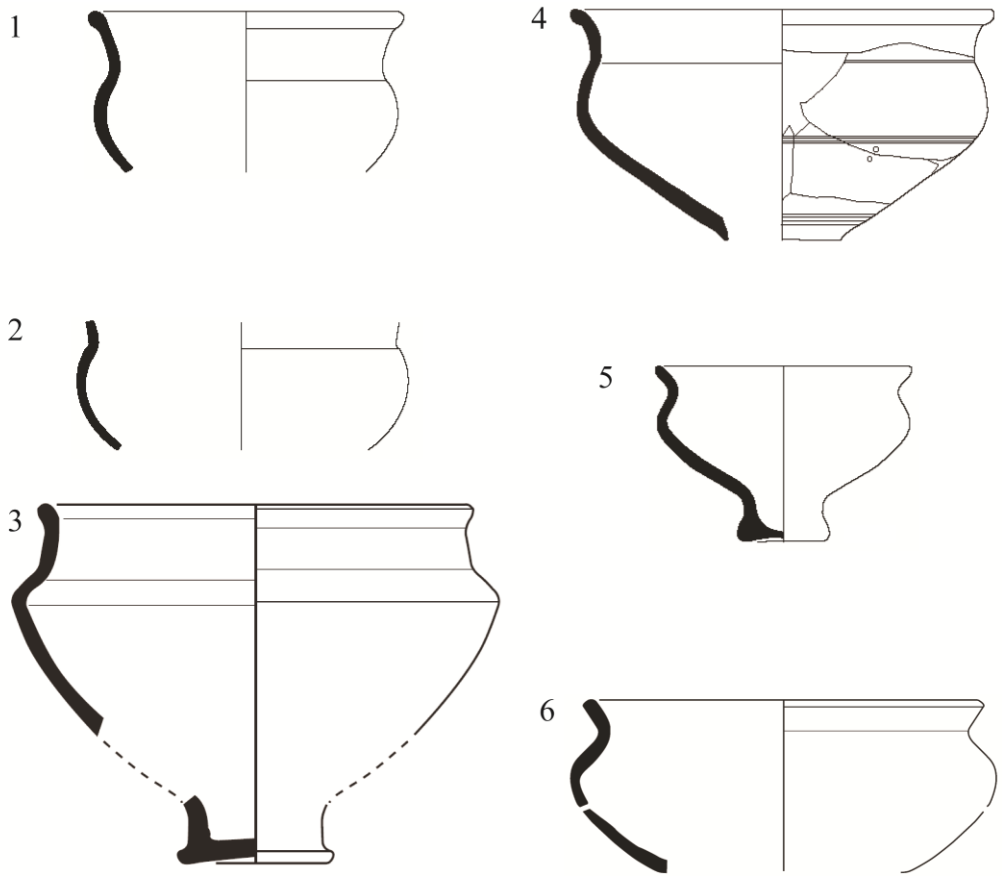


Figure 80 Selection of drawings from the sampled foot-vessels from the Netherlands: 1-4. Wijk-bij-Duurstede, 5. Wijchen, 6. Geldrop (Drawings S. Heeren, varying scale).

7.2.2 Typology of Gellep 273 and 274

In the Hellweg region, the area between the rivers Lippe and Ruhr, the Late Roman terra nigra is closely linked to foot-vessels of the types Gellep 273 and 274 (Figure 81). Both types occur in a fabric that appears to be generally limited to the Hellweg area, based on a macroscopical and typological comparison in the current study on the Hellweg pottery (Agricola, forthcoming). Notable for these vessel types are the findings and the typology of the cemetery from Krefeld-Gellep (Pirling 2006, 189). The type Gellep 273 is described as a bowl, while the type Gellep 274 is a downscaled cup-like variation of Gellep 273. The basic form of the types Gellep 274 and 273 is high oval. The neck is funnel-shaped and bends slightly outwards. Between the neck and the vaulted shoulder can be an off-set or a slight groove which separates the two areas. Below the vaulted shoulder the vessel becomes narrower ending in a clearly separated foot.

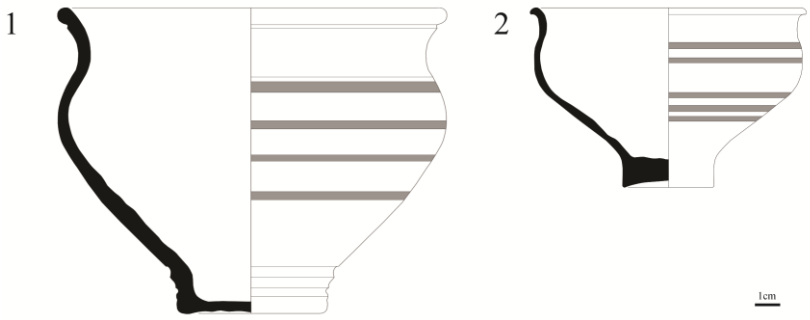


Figure 81 Examples of Late Roman terra nigra foot-vessels Gellep 273 (1) and Gellep 274 (2). – (Drawing C. Agricola). – Scale 1:3.

Connected with these two vessel types are four different rim types (Figure 82): the first rim type is characterised by a sub-rounded rim profile which is separated from the neck by a groove (Schoppa 1970a, 39; 1970b, 114). In contrast, the second type shows a completely beaded rim profile. A more or less distinctive groove separates the rim from the neck (Schoppa 1970a, 40; 1970b, 114). The third rim type is smooth and shows no further structure. A few sherds possess a slightly thickened rim lipp (Schoppa 1970a, 39; 1970b, 114). A characteristic of the fourth type is a triangular rim profile, i.e.. the rim is pointed at the end and the overall profile appears almost triangular.

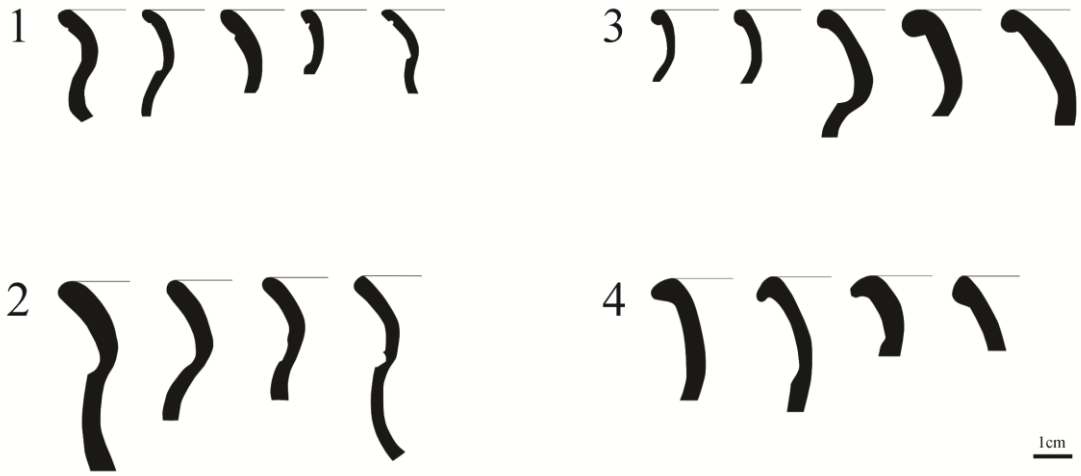


Figure 82 Main rim types for Late Roman terra nigra foot-vessels Gellep 273 and 274. – (Drawings C. Agricola). – Scale 1:3.

In addition to the rim types, it is possible to distinguish three different foot forms (Figure 83). The main characteristic of this type is the cylindrical form which is separated from the body by a right angled indentation. At the end of the foot is a more or less distinctive groove and the bottom edge is often wiped off (foot type a, after Schoppa 1970a, 40). There are great similarities to the first type. The only difference is the rounded

cordon which separates the foot from the wall (foot type a, after Schoppa 1970b, 40). Up to this point, no proper investigation of a known workshop and its production have yet been carried out.

Figure 83 Main foot types for Late Roman terra nigra foot-vessels Gellep 273 and 274. - (Drawings C. Agricola). – Scale 1:3.

7.2.3 Distribution

The general distribution of the Late Roman terra nigra foot-vessels is concentrated mainly in the region stretching from northwest Germany to the Dutch river area over the eastern Netherlands, with a wider dispersion in other parts of Germany, the Netherlands, Belgium and France. A distinction has been made between the Chenet 342 types and the Gellep 273/274. It has to be noted that this distribution is subject to potential misidentification of the type of foot-vessel. Additionally, this map (Figure 84) cannot be seen as an exhaustive overview of all Late Roman terra nigra wares and forms, but simply the state of research into the foot-vessels described above. From this map, we can see that a large and dense concentration of Gellep-vessels is distributed along the Rhine, mostly on the right bank. The Chenet-vessels are more widely dispersed, but apparently in lower concentrations, with only sporadic larger quantities. The distribution stretches mainly from present-day Frisia in the northern Netherlands to the Rhine in the Elzas and the Seine in France, with only a few exceptions south of the Seine. When the two different types are separated, it becomes clear that there is a spatial difference, with a significant overlap in the Dutch river area, whether this is the result of production or consumption processes or even merely an archaeological reality, will be discussed later on.

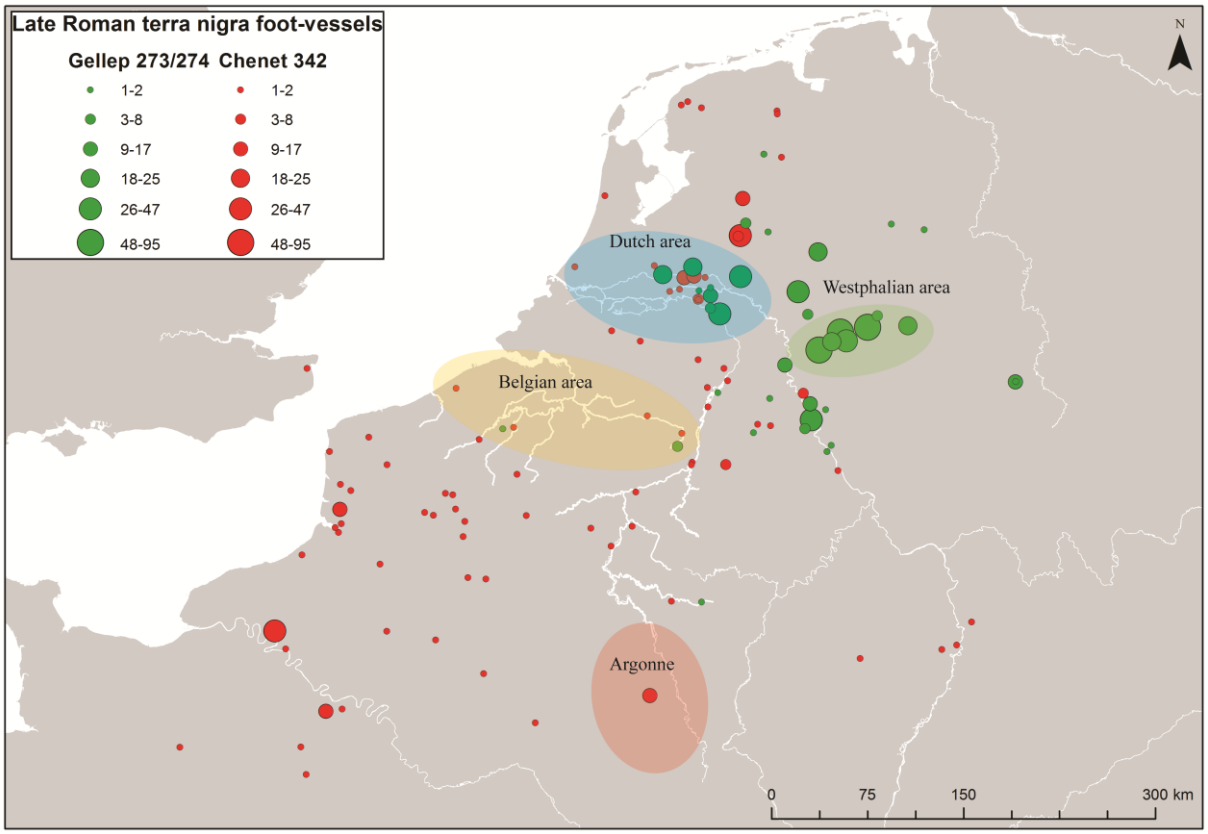


Figure 84 Distribution map of Gellep 273-274 and Chenet 342. Samples for ceramic analyses were collected from the Westphalian (green), Dutch (blue) and Belgian (yellow) areas (see Appendix 3 for more information on the sites and number of finds).

7.3 Ceramic analyses

Samples were selected from German, Dutch and Belgian sites for this comparative study. The first macroscopical and microscopical observations focus on surface and fabric properties. The second part applies geochemical and petrographic analyses to determine the chemical and mineralogical composition of this ware in order to investigate matters of technology, provenance and distribution.

7.3.1 Chemical analyses by portable XRF

For the geochemical analyses a portable energy dispersive X-ray fluorescence (pXRF) device of the type XL3t 900s He GOLDD+ by the company Thermo Scientific Niton was used. The spectrometer has a 50 KV x-ray tube with Ag-Anode and a measuring spot of 8

mm². Measurements were carried out in air at room temperature (ca. 20 °C). A specific empirical calibration for archaeological pottery was used, based upon the geochemical data of 140 sherds of different fabrics which have been formerly analysed with Wavelength Dispersive X-ray Fluorescence (WD-XRF) (Helfert 2013, 25). The total measurement time amounted to 360 sec dependents on the different measuring filters (Helfert 2013, 31): 120 sec for the light filter, 90 sec for the main filter, 90 sec for the low filter and 60 sec for the high filter. In total 19 elements were measured and used for the evaluation: Si, Al, Ti, Fe, Mn, Ca, K, P, V, Cr, Ni, Cu, Zn, Rb, Sr, Y, Zr, Nb and Ba. Only rim and bottom sherds have been analysed. Each sherd was measured at three different fresh breaks to reduce the contamination effects of the soil in which the samples have been deposited. Furthermore, influences of a special treatment of the surface such as coatings or sintering are avoided as well (Helfert and Böhme 2010, 21-23; Behrendt, Mielke and Mecking 2012, 95-98). In order to evaluate the geochemical data, the average values of the triple measurements were calculated in IBM SPSS. Working with the average value minimises the effect of inhomogeneity and temper in the fabric on the analysis (Helfert, Böhme 2010, 22; Behrendt, Mielke, Mecking 2012, 99-101).

7.3.2 Ceramic petrography

The selection of samples was driven by the intention to cover the majority of the distribution area as well as the variety of fabrics of this pottery type. Preference for thin sections (0.03mm slices of ceramic material) was given to rim and bottom sherds, although when these were not available, body sherds were selected instead. In order to establish the mineralogical composition and identify potential temper, the thin sections were studied under a polarizing microscope (x10 to x40) using Plane Polarised Light (PPL) and Crossed Polars (XP). The petrographic analysis does not only look at the mineralogical properties of the ceramics, but its technological aspects are equally important. Such as the homogenisation (i.e the kneading of the tempered ware) and traces of building technique are of interest to understand and characterise the craft. The effects of firing – temperature and atmosphere – as well as results of use and post-depositional alterations/pollution may also be noted. Thus the thin section method also supplies crucial information for understanding the results of chemical analyses in terms of craft actions or later alterations.

7.4 Geochemical and petrographic characterisation

7.4.1 Description of the Westphalian and Dutch-Belgian fabrics

In the region of Westphalia, foot-vessels of the type Gellep 273 and 274 were produced in one fabric which can be divided in two major groups, that can be further subdivided based on a recent pilot-study (Pers. Communication C. Agricola). The overall distinctive feature of the general fabric is the white or grey fine clay of high quality and an absence of temper. The surface colour varies between light grey and black, often containing dots/spots of the same colour. Some vessels show a metallic hue which is caused by smoking at the end of the firing. During this process, which occurs in a reduced firing atmosphere, carbon is deposited at the surface of the pottery as lustrous carbon and causes the characteristic metallic hue (Noll 1991, 175-181; Heimann, et al. 2014, 90-91). The spots at the surface of the vessels might be caused by their close position to each other in the kiln. This general fabric can be divided further into two groups:

7.4.1.1 Westphalian Fabric (WF) Group A

The non-plastic elements are rare, but there are heterogeneous particles of different sizes. Very rare are bright, round quartz particles with a size of 0.5 to 1 mm. Additionally there are sometimes grey or black particles of 0.5 mm visible. Rare to moderate elongated pores exist, of which the quantity varies per sherd. Furthermore, grey or bright white particles are present which can be seen only in the polished fractures. The particles usually have a size of less than 0.1 mm and are moderately to heavily distributed.

7.4.1.2 Westphalian Fabric (WF) Group B

This group is similar, yet distinct from the first one, although the separation of these two groups can be difficult, often it is only possible to do so based on a polished fracture. Besides the elongated pores of WF group A, small rounded pores of 0.1 – 0.2 mm occur in the sherd. These pores are present in moderate to abundant quantities. The grey or black particles are more common in this group and range to 1 mm in size. Similar to WF group A, there are grey or bright white particles which can only be seen in the polished fractures. They are present in moderate to abundant quantities and in some sherds the particles can be up to 0.1 – 0.2 mm in size.

7.4.1.3 Dutch-Belgian (DB) fabrics

Among the Dutch-Belgian samples, most foot-vessels seem to be of the Chenet 342 type, although Gellep 273/274 also occasionally can be found. Often the fractured nature of the pots makes it difficult to distinguish typologically between Chenet and Gellep. The fabrics vary from a white/light grey colour in a fresh break to very dark grey or brown-grey, in accordance with a reduced atmosphere. Although the clay is generally fine to very fine, the properties of the quartz grains ranges between rounded and angular, clear to clouded, and can differ much in size as well. Occasional black inclusions and micas can be observed, as well as elongated pores. Often the clay used appears to be rich in iron oxide concentrations, which is sometimes mistaken for '*chamotte*' (small red grog fragments). None of the sherds appear to have been tempered. On the surface, a mainly dark exterior was attempted, dull or polished, as well as lighter examples. A few examples have a metallic hue, both dark and light. In general, these properties show much resemblance to the Westphalian fabrics, although no apparent trends can be found to classify them in distinct fabric groups. The general technique suggests a rather homogenised and well-prepared clay of a certain high quality, and the variations remain within a fixed spectre of desired effects.

Figure 85 1 Examples of Dutch-Belgian Late Roman terra nigra fabrics on foot-vessels (scale 1:3): 1 Dark metallic hue, Asper (Gavere, BE). – 2 Light metallic hue, Neerharen-Rekem (Lanaken, BE). – 3 Dull dark, Oudenburg (BE). – 4 Dull dark coated, Tongeren (BE). – 5 Dull light grey, Oudenburg (BE). – 6 Dull grey, Tongeren (BE). – (Photographs by V. Van Thienen, D. Jehs, G. Schalenbourg). - Scale 1:3.

7.4.2 Geochemical results from German and Dutch samples

The results presented here are based on the total of 397 samples from 13 different sites, of which 210 samples derive from the Netherlands and 187 from sites in the German Hellweg region in Westphalia. The Dutch samples consist of different fabrics and vessels of the type Chenet 342, whereas the samples of the Hellweg region consist of the formerly described fabric mainly composed of vessel types Gellep 273 and 274. Unfortunately, no samples from Belgium were analysed due to time constraints. The Dutch samples cover the entire range of Dutch-Belgian fabrics for the Chenet 342 type and can at this point be regarded as a proxy for the chemical characteristics of the Belgian vessels.

The bivariate diagram of the elements silicon and aluminium (Figure 86) shows two correlation lines. One is linked to the Westphalian fabric samples while the other is mainly linked to the Dutch-Belgian samples. The relation of the two elements provides information about the proportion of clay and sand in the fabric. According to this, a correlation line of silicon and aluminium could be a sign of possibly levigated clays which derive from the same clay source/bed (Schneider 1988; Helfert 2010). Apparently the Westphalian fabric and the Dutch-Belgian fabrics were made from different clays. Clearly recognisable is a spread of samples between the two correlation lines. These intersections may be caused by the adding of temper during clay preparation, depositional effects or a wrong fabric classification. The scattered samples can also be explained by the scattering of the element silicon caused by the measuring method of p-XRF (Helfert et al. 2011, 12). Below the correlation lines is a group of outliers located which does not match with the other samples. These differences in silicon and aluminium content could be caused by adding different temper. It is possible that these samples are outliers or derive from a different clay source.

In order to validate these results, other elements were compared as well. The chart of titanium and niobium (Figure 87) shows an obvious separation between the Dutch samples and the ones from the Hellweg. In the case of the Hellweg samples it is possible to observe a faint separation in two groups, although the difference is not very distinct. For this reason, the Hellweg samples are addressed here as one chemical group. Compared to the Dutch samples, the Hellweg samples are characterised by a higher titanium and niobium content. Moreover, the Dutch samples form a clearly defined group with lower titanium and niobium contents. Nevertheless, there's a small group of Dutch samples overlapping with the ones from the Hellweg. In order to verify or falsify these results

additional bivariate and trivariate diagrams were made. Confirmation to distinguish between a geochemical group from the Hellwig samples and a separate group for the Dutch samples, can be found in the diagram of the elements iron and niobium (Figure 88). Furthermore, the group of Dutch samples showing an intersection with the samples of the Hellweg in the previous diagram of titanium and niobium, is separated from the remaining samples and form another group. The trivariate diagram of the elements iron, potassium and niobium (Figure 89) confirm the previous results and the formation of the groups. In all diagrams a few samples of the Hellweg fabric are visible in the group of the Dutch samples. This can be explained by wrong classification, measurement errors or outliers.

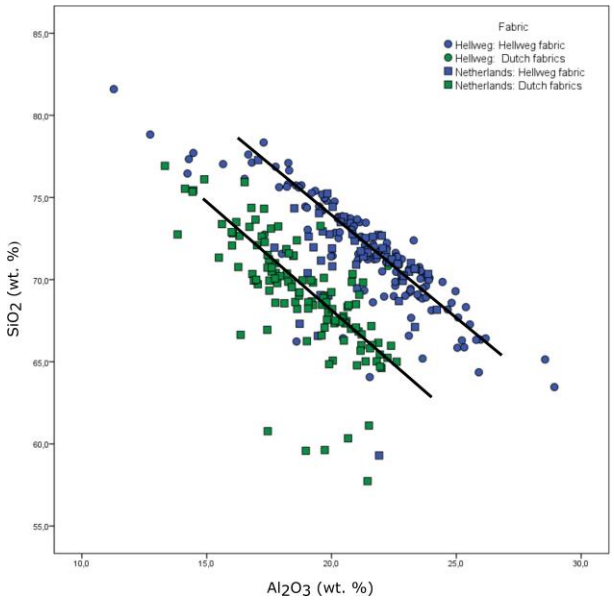


Figure 86 Diagram of SiO_2 and Al_2O_3. The samples form two different correlation lines consisting of the Hellweg fabric (blue) and the Dutch fabrics (green) (n = 397).

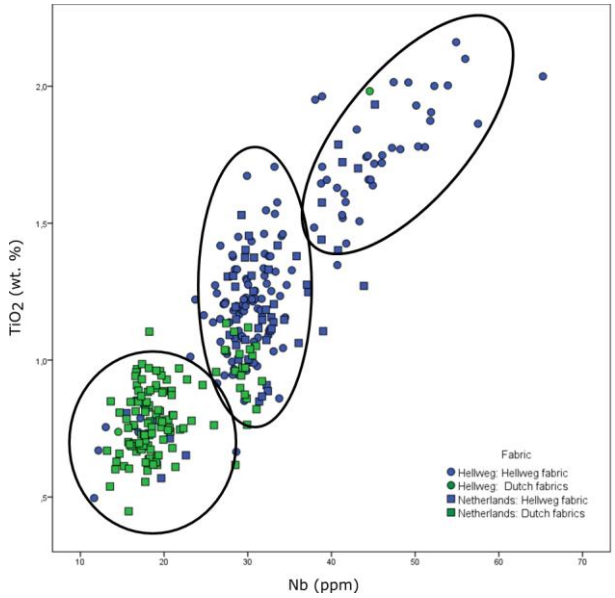


Figure 87 Diagram of TiO_2 and Nb. Due to the different contents of titanium and niobium two different groups are emerging (n = 397).

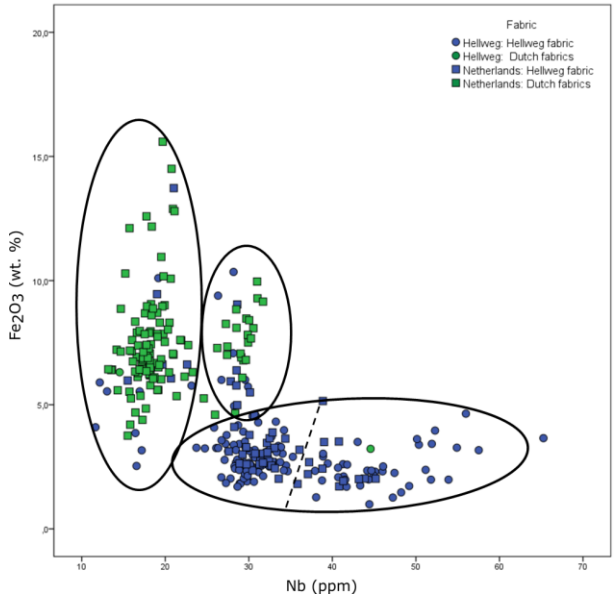


Figure 88 Diagram of Fe_2O_3 and Nb. Discernible is the separation between the Hellweg fabric and the Dutch fabrics. A small group of samples is distinguished from the main group of Dutch fabrics by higher niobium contents (n = 397).

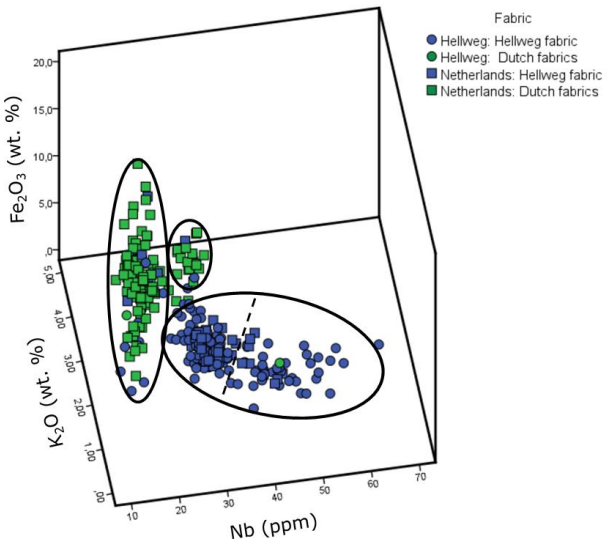


Figure 89 Diagram of Fe_2O_3, K_2O and Nb. The group formation of the previous diagrams shows also up in this diagram of the three elements and is confirmed (n = 397).

7.4.3 Petrographic results from German, Dutch and Belgian samples

7.4.3.1 Late Roman Terra Nigra in Belgium, The Netherlands and Westphalia

The here presented comparison of petrographic results is based on a number of samples from Belgium, The Netherlands and Westphalia. In total, 82 samples were taken from Belgium and the Netherlands, from which a selection of 25 thin sections was studied in direct comparison with the German samples. The Dutch-Belgian samples were first observed macroscopically and under an optical microscope with visible light in order to make a fabric distinction based on observations from fresh breaks. After this initial distinction, the Dutch-Belgian material was classified into four group. The Westphalian material was classified into five groups, independently from the Dutch-Belgian classification, i.e. both groupings occurred separately from each other and the group numbers were appointed independently. Following the separate classification, the most similar groups of both regions were chosen to be presented here to facilitate an interregional view on the Late Roman terra nigra. First, the Dutch-Belgian petrographic groups will be reviewed after which we will focus on the results of thin section analyses from the site of Castrop-Rauxel/Ickern (CR/I) group 1 and the Dutch-Belgian (DB) group 1, as they point to a possible link between all areas. The thin sections have been analysed as described above. In order to make a statistical comparison of the sorting of the naturally occurring fine fractions of the clays, the grains cut by the horizontal cross-hair

in the ocular (100x magnification) at four random locations in the sample have been measured (longest axis) and counted.

7.4.3.1.1 Dutch-Belgian – Petrographic groups 1-4

The grouping of the Dutch-Belgian thin sections was established in correspondence with the method applied for the German samples (by Stilborg) to facilitate the integration in the interregional comparison. The grouping was made based on the clay coarseness and sorting, as well as the mineralogy and other inclusions (see Appendix 3 for a schematic description of each thin section). The differences in mineralogy was given priority over the coarseness, given that the latter may be the reflection of different depths in the same clay bed (Pers. communication O. Stilborg).

The samples belonging to the Dutch-Belgian group 1 (Figure 90) are characterised by sorted clays rich in silt and with a limited amount of dark minerals (often including some grains of zircon and an isotropic mineral). The amount of muscovite (white mica) varies and is high in some wares. Most wares contain a few microcrystalline grains (chert/siltstone). The clays are probably levigated although it is not impossible to find this quality of raw clay in the nature. Subgroup 1A and 1A1 (sample 2, 15, 41, 51; 10, 13, 17) fits the description above and are subdivided on the basis of their general likeness in sorting. The maximum grain size varies from 0.3 to 0.9 mm. The subgroup 1A1 is characterised by a large amount of muscovite and the ware of these three samples is very similar. Subgroup 1B distinguishes itself by a high content of silt with a max grain size of 0.5 mm, whereas 1C has less silt. The final subgroup 1D is defined by a large amount of microcrystalline grains.

The second petrographic group (Figure 91) differs mainly from the first group by its medium coarse fine sand rich sorting and very few dark minerals. The maximum grain size is fairly consistent around 0.4 – 0.5 mm.

The Dutch-Belgian petrographic group 3 (Figure 91) shares many similarities with group 1, characterised by sorted clay with a very high amount of silt, which leaves little room for clay, i.e. that this clay would have had a fairly low plasticity (communication Stilborg). In addition, it distinguishes itself from the other groups by the presence of brown grains (isotropic in XP), which might be altered glauconite, however this is not sure. The maximum grain size averages ca. 0.4-0.6 mm.

The fourth group (Figure 91) from the gathered Dutch-Belgian samples has the same medium coarse clay as group 2, although with a more varied sorting and characterised by

the absence of dark minerals. Additionally, large amounts of microcrystalline grains (chert/polycrystalline quartz) can be found in these samples. The latter corresponds with subgroup 1D, although the clay coarseness differs. Maximum measured grain size for this group is 0.5-0.6 mm. Group 4 has been divided in two subgroups. Subgroup 4A corresponds with the given description and subgroup 4B as well, with the only addition of grog. It is not clear if this is an intended grog temper, since it only is present in three samples, which derive all from the Roman fort of Oudenburg, and are all in a vitrified state (see Chapter 6). In all three thin sections, only a single grain occurs, although a large grain of 2.5 mm has been observed in one case (LRTN04), which would be hard to miss in the preparation process and is in this case regarded as an outlier.

Finally, some unique wares were present in the samples, which means that they are the sole representatives of their petrographic group from this data set. Three possible explanations present themselves: the first possibility is that these are indeed unique wares, i.e. one of a kind; the second and most likely explanation is that these unique wares are an underrepresented variation of the same ware; the third option is that these samples do not belong to the same ware or typology. Unfortunately, due to the fragmentation present in the sampled population, the latter is probable. This issue will remain uncertain until more samples have been investigated by means of thin sections.

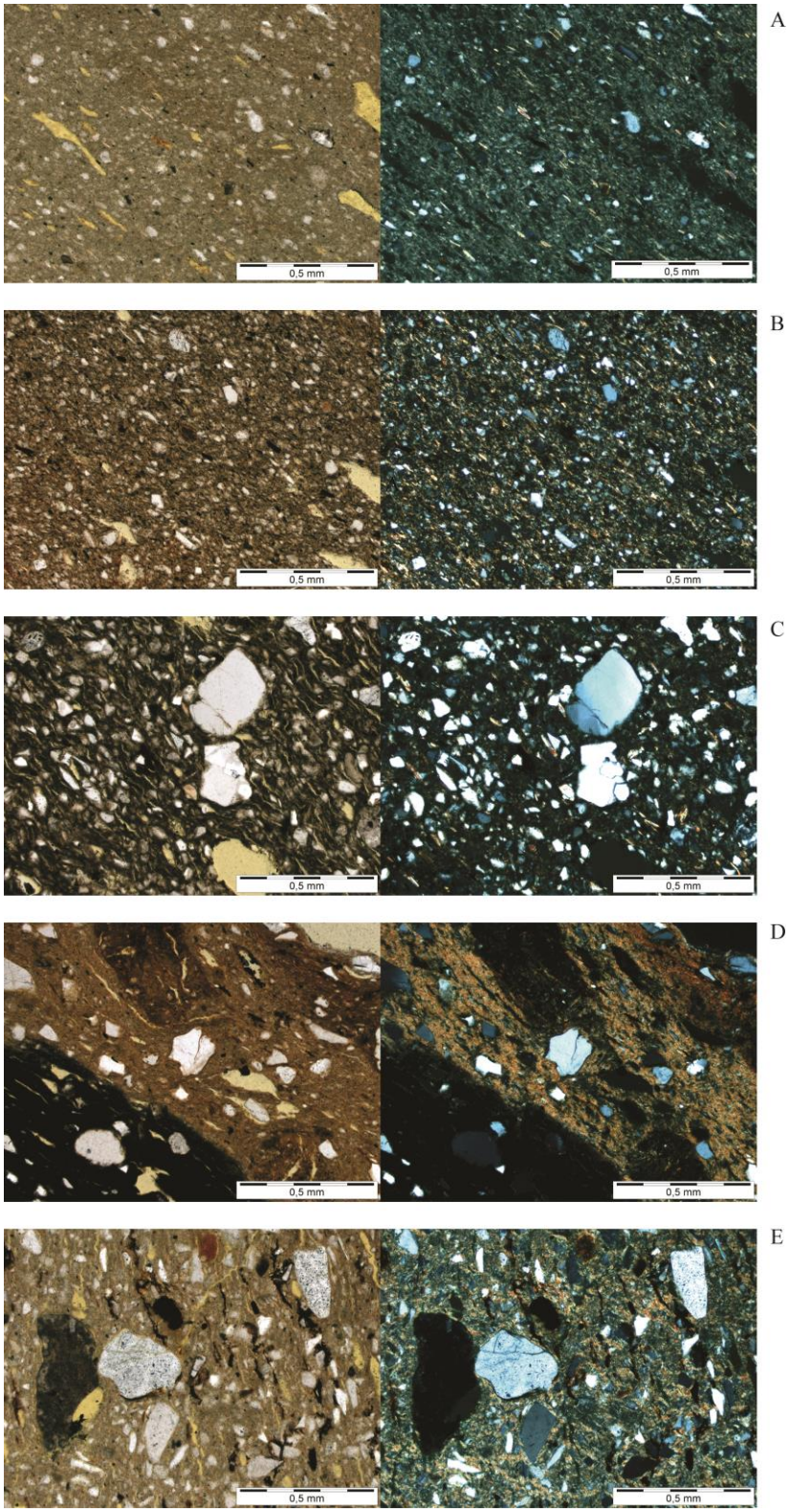


Figure 90 Microphotographs of thin sections in plain polarised light (PPL) and crossed polars (XP) from the Dutch-Belgian subgroups: A DB 1A Wehl (NL). - B DB 1A1 Lummen (BE). – C DB 1B Breda (NL). – D DB 1C Oudenburg (BE). – E DB 1D Wijk-bij-Duurstede (NL). – (Photo V. Van Thienen). – Scale bar 0.5 mm.

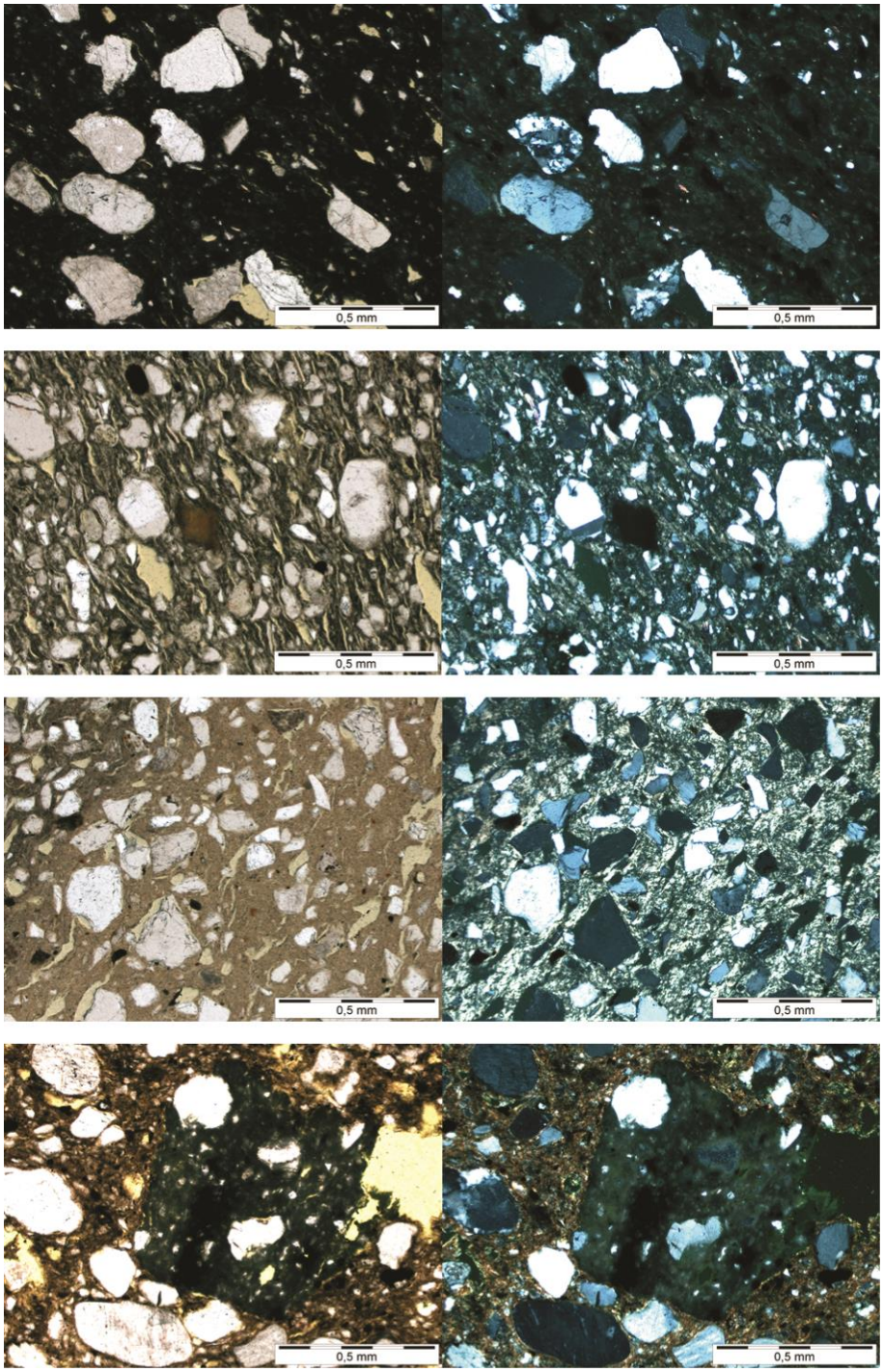


Figure 91 Microphotographs of thin sections in plain polarised light (PPL) and crossed polars (XP) from the Dutch-Belgian Petrographic groups. DB 2 Oudenburg (BE) (LRTN30) – DB 3 Breda (NL) (LRTN82) - DB 4A Oudenburg (BE) (LRTN23) – DB 4B Oudenburg (BE) (LRTN33) – (Photo V. Van Thienen) – Scalebar 0.5mm.

From the descriptions above, it is clear that these subgroups are related to each other and point towards a more quality-related product in which great care is taken in the preparation or search of the fine clay. At first observation of the thin sections, only a variety of the quartz grains is noted, although much more characteristics become

apparent after detailed study of each thin section. In general, without considering the outliers, the Dutch-Belgian Late Roman terra nigra ware is characterised by a fine to medium coarse clay, mostly rich in silt or fine sand without added temper. Furthermore, microcrystalline grains such as chert, siltstone and polycrystalline quartz are frequently encountered, as well as the presence of mica, mainly muscovite flakes, and iron oxide. Additionally, (plagioclase) feldspars, dark minerals (amphibole and pyroxene), clay pellets and isotropic minerals are common inclusions. Less frequent are inclusions of zircon, biotite and hornblende. On occasion, some plant material can be observed, although, this appears to be a natural occurrence in the clay rather than an added temper, especially when compared with the plant tempered handmade pottery. The encountered grog grains are always a single appearance in a thin section and outside subgroup 4B, only three potential grog grains (sometimes it is difficult to distinguish from clay pellet) were observed. All in all, these grog inclusions do not appear to be intended as a grog temper, again the difference in comparison with the handmade pottery is considerable. Overall, the ware structure is homogenised to well homogenised and has an average maximum grain size of 0.4-0.6 mm.

7.4.3.1.2 Distribution of the Dutch-Belgian groups

Before evaluating the distribution of the Dutch-Belgian petrographic groups, it has to be noted that a different number of samples are gathered from each site, due to the total amount of finds and the permission to take samples. This does not allow for a complete quantitative approach, for this would bias all results towards the sites with the most samples. Consequently, it is decided to only make a brief overview of the presence and distribution of each petrographic group and subgroup, and rather focus on a qualitative evaluation of the distribution in order to gain insights in the nature of the production of this ware.

The dominance of group 1 among the Dutch-Belgian material is evident from the presence of 50 samples out of the total 82 gathered (Figure 92, Figure 93 and Table 16) and their presence on all sampled sites from the Netherlands and Belgium. Subgroups 1A and 1A1 together take up approximately 2/3rd of this group, followed by 1D with a quarter of the population. Subgroups 1B and 1C are less occurring. Samples of 1B are only found in Breda (NL) and subgroup 1C only presents itself on the Belgian sites of Oudenburg and Tongeren. The main subgroup 1A has the largest spread over 12 of the 18 sites, followed by A1 and D equally showing up on little less than half of the sites.

In contrast to group 1, group 2 is a minor group, which occurs only in Oudenburg (BE). Similarly, group 3 also has a limited distribution with only a few examples on 4 sites, of which 5 out of 6 samples occur in the Netherlands (Wijk bij Duurstede, Rijswijk and Breda) and only one is from Belgium (Oudenburg). From the distribution map (Figure 92), this group appears to be focussed in the west of the research area. Whether this is a representative pattern for this group, remains to be confirmed by additional research. Group 4 is again more present in the sampled population, with approximately 15% of the samples, although spread over only 5 sites. The majority is again found in Oudenburg, with only one sample in Lanaken (BE), Lummen (BE), Tiel-Passewaaij (NL) and Breda (NL). Subgroup 4B is restricted to Oudenburg, whereas subtype 4A is found on all 5 sites. Finally, the unique wares are mostly singular exceptions spread over 5 sites (Lanaken, Oudenburg, Tongeren, Tiel-Passewaaij and Wijk bij Duurstede). Only Tiel-Passewaai has two samples with a deviating mineralogical characterisation.

Table 16 Dutch-Belgian Petrographic groups and subgroup with number of samples, the respective percentages of the total population (n = 82) and the number of sites these samples occur on, with their respective percentages towards the total number of sites (18).

Group	samples		sites	
1	50	61%	18	100%
2	8	10%	1	6%
3	6	7%	4	22%
4	12	15%	5	28%
U	6	7%	5	28%

Subgroup	samples		sites	
1A	18	22%	12	67%
1A1	13	16%	8	44%
1B	4	5%	1	6%
1C	2	2%	2	11%
1D	13	16%	6	33%
2	8	10%	1	6%
3	6	7%	4	22%
4A	9	11%	5	28%
4B	3	4%	1	6%
U	6	7%	5	28%

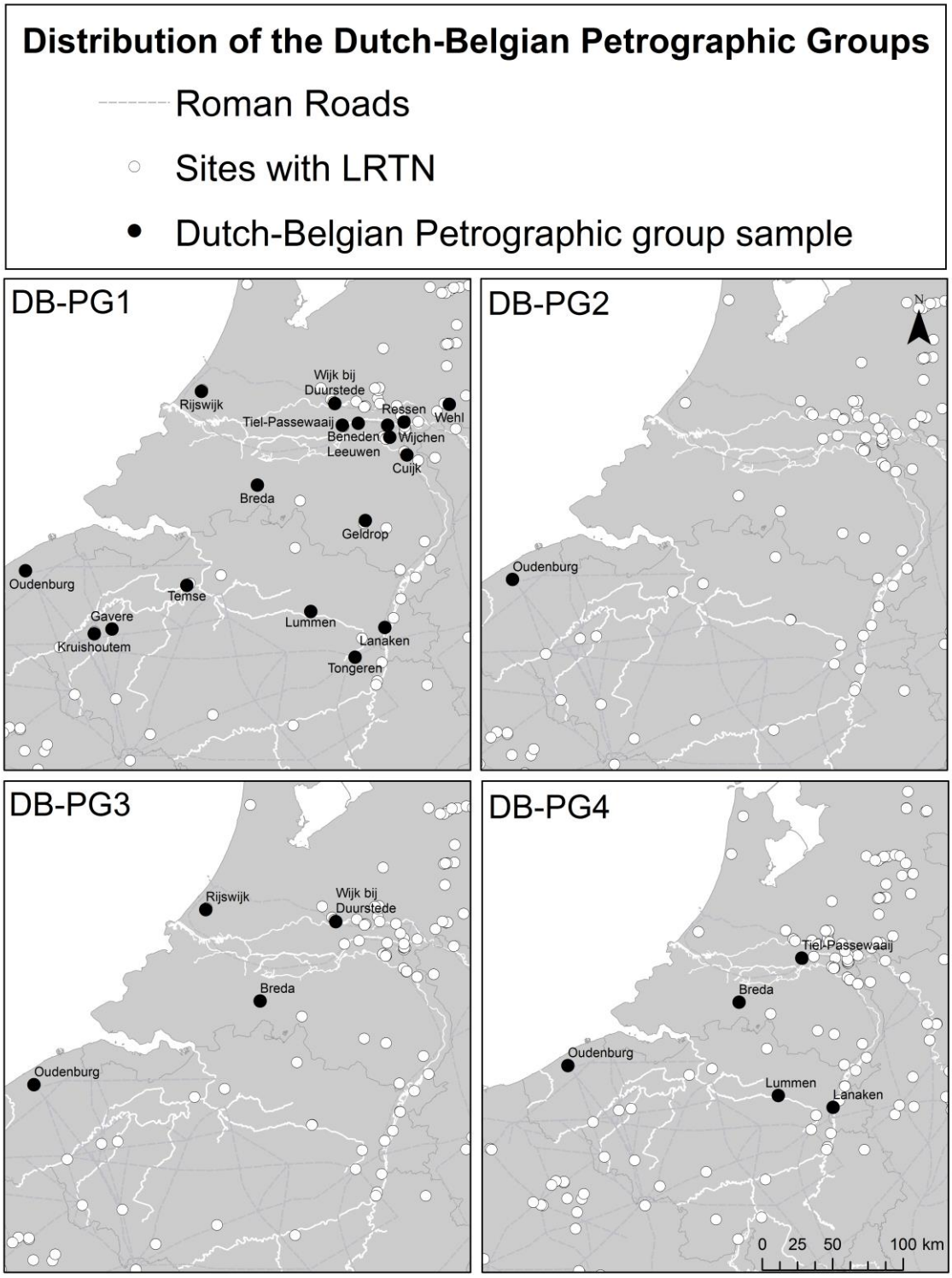


Figure 92 Distribution of the Dutch-Belgian Petrographic groups 1 to 4 (DB-PG1-4)

Remarkable is the absence of 1A in Oudenburg, and only one example of 1A1. Moreover, taking into account the large sample population from Oudenburg, the presence of all four groups and that subgroup 1A/1A1 is the most common petrographic group for the Late Roman terra nigra, this could indicate a significant different behaviour for production or consumption on this site. Furthermore, the military fort deviates further from the rest by the only site containing the coarser group 2 and the largest amount of group 4 samples, which points to another deviating aspect from the normal spectre: the presence of grog. The encounter of a single grog grain inclusion is not restricted to Oudenburg, however, it is the site with more than one occurrence, as expressed in the sole presence of subgroup 4B on this site. It is possible that this image is merely a bias by the largest number of samples for this site, however, the number of anomalies from the common pattern suggest otherwise.

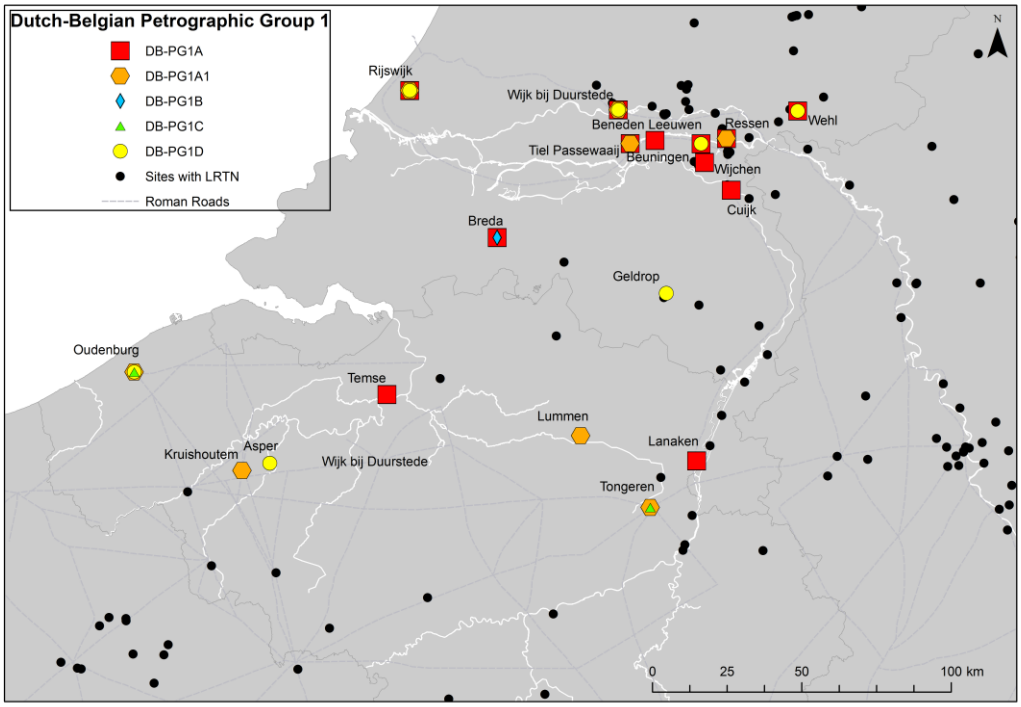


Figure 93 Distribution of the subgroups of Dutch-Belgian Petrographic: DB 1A, DB 1A1, DB 1B, DB 1C and DB 1D. The black dots represent sites on which Late Roman terra nigra foot-vessels have been found.

Overall, the main ware of Late Roman terra nigra foot-vessels seems to be expressed in the properties of group 1 for Belgium and the Netherlands. Groups 2-4 have a more limited distribution, perhaps indicating a local or regional variant on the main pottery group. As mentioned before, group 2 is restricted to Oudenburg and is characterised by

the coarser nature of the clay. At this stage, group 3 appears to be limited to the west of the research area, with the main presence in Rijswijk (NL). Group 4 is again more widespread, although less in numbers per site, of which Oudenburg is again the exception.

In order to look for explanations in this spatial diversity in the petrographic groups, a comparison with the major fabrics, foot type, typology, chronology and context has been attempted. Unfortunately, the no significant or distinct correlation could be derived from the current sample population between these factors. The only potential cross-category relation is the appearance of subgroup 1A1 in both Chenet 342a and b, as well in all fabrics except for the light grey metallic hue. This might possibly point to a continued production in the same fine quality, although expressed in different fabrics, for the second half of the 4th century and the first half of the 5th century. Whether this is an actual trend, or whether this implies the continued use of the same clay source or the continued use of the same clay preparation technique (i.e. levigation), remains unclear.

A final thought related to group 1, and more specifically subgroups 1A and 1A1, show remarkable similarities to Low Lands Ware, which dominates the same distribution area (Figure 94) along the rivers earlier in the Roman period (De Clercq 2008). Production in the Bergen-op-Zoom area is suggested using clay from the Tegelen formation. The composition of Low Lands Ware Group 1 is characterised by a mineral content of ca. 80%, which is dominated by quartz, opaque minerals (mainly iron oxides), garnet and muscovite mica (Figure 95). Sporadically, fragments of sandstone, grog and organic material can be observed. In general, LLW1 is seen as a single, chemically and mineralogical homogenous group (De Clercq and Degryse 2008, 450), which also matches the observation for the Dutch-Belgian LRTN group 1 as a whole. The high concentration of muscovite is characteristic for the Tegelen clay source, which was exploited on a large scale from the late 1st century AD and peaked in the 2nd and 3rd century. The latest finds of the known forms in this fabric are known from Breda and Oudenburg, and date to ca. the third quarter of the 3rd century (De Clercq and Degryse 2008, 456). Direct comparison of thin sections and geochemical analyses on the Dutch-Belgian Late Roman terra nigra group 1 could possibly confirm if the same clay source was still used in the 4th and 5th century.

In conclusion, we can state that the most promising fabric for a large scale or imported product is the Dutch-Belgian petrographic group 1, which appears on all sampled sites and is very well presented in the overlap area of both Chenet and Gellep forms of the Late Roman terra nigra foot-vessels in the southern Netherlands along the Rhine and Meuse.

Potential evidence for local workshops or deviating production or consumption can be seen in Oudenburg, especially for the coarser wares (groups 2 and 4), and additionally somewhere in the west of the Netherlands, possibly Rijswijk or Breda, seen from the limited distribution of group 3 and subgroup 1B. To further explore the possibility of a large scale production, expressed in the Dutch-Belgian group 1, the comparison with the Westphalian material will be made.

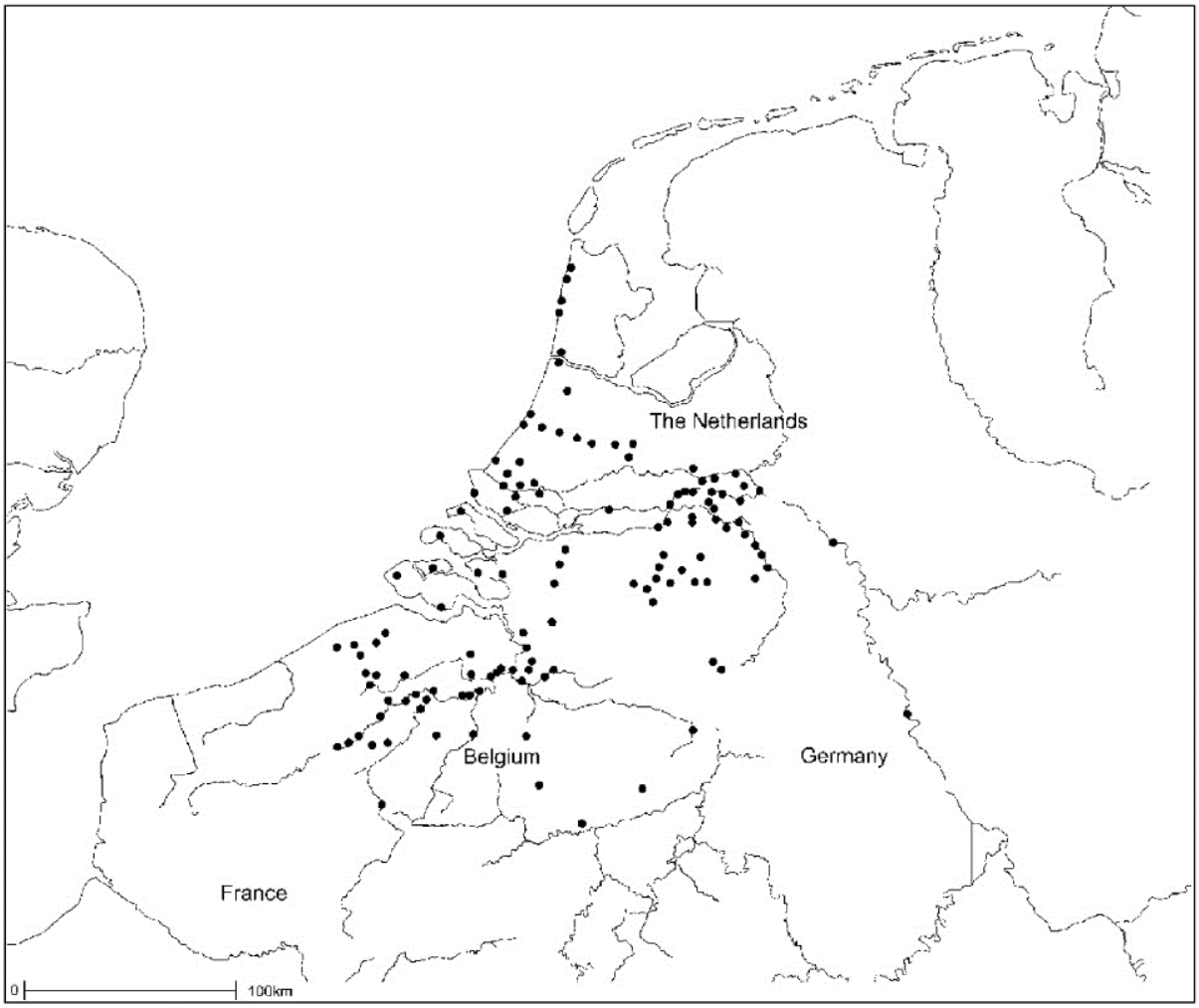


Figure 94 Distribution of Low Lands Ware 1 (De Clercq and Degryse 2008, 456, fig. 6).

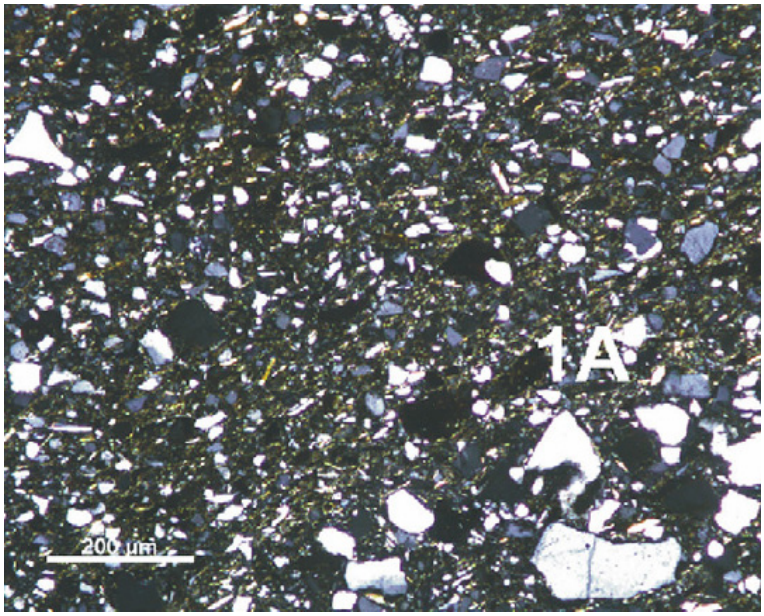


Figure 95 Photomicrographs of Low Lands Ware 1 in crossed polars (XP) (De Clercq and Degryse 2008, 451, fig. 2).

7.4.3.2 Westphalian // Castrop-Rauxel/Ickern – Petrographic group 1

Of the six samples analysed so far from this material, four share a set of mineralogical characteristics. They are made from silt rich clays with dark minerals, zircon, muscovite needles, small grains of an isotropic mineral and small flint grains. No temper has been added. There are some differences in the amount and sorting of the non-plastic fractions (max grain varies between 0,4 and 0,6 mm) as well as in the amount and distribution of the iron oxide, but the differences are not larger than what could be expected within the same clay bed. In addition, the sorting of two of the samples indicate that they may have been levigated. This group has been named clay group 1. Compared to new analyses currently being processed, this group seems to keep its integrity. Looking at the relationship between the number of grains and the average size of these grains in the fine fraction of three of the samples (Figure 97), we see that they are situated along a line. The two presumably levigated samples have the highest counts of grains and the smallest average grain sizes in accordance with what would be the expected result of a levigation.

7.4.3.3 Comparison across the borders

From the description given above, it becomes apparent that there is a good mineralogical correlation between the Dutch-Belgian group 1A(1) samples and the Westphalian group 1 (Table 17 and Figure 96). If we furthermore compare the sorting, using the same analyses of the fine fraction (Figure 97), we see even here a good match with the finer

sorted, presumably levigated, samples from Westphalia. The coarser sorted samples of type Westphalian 1 may be examples of less well executed levigation or of wares made from the raw clay which in other cases was levigated before use (observe the correlation line in the chemical results).

This group of vessels - five Belgian (Oudenburg, Lummen, Kruishoutem, Lanaken, Temse), one Dutch (Wijk-bij-Duurstede) and one Westphalian (Castrop-Rauxel/Ickern) – is an example of the type of grouping that may represent products from the same production based on mineralogy and sorting. To reach a higher degree of certainty we need the analyses of secure production wasters for comparison.

Table 17 Description of four representative thin sections for the CR/I group 1 and the DB group 1 (O. Stilborg).

Observations	*CR/I 1 (Ts 1)*	*CR/I 1 (Ts 2)*	*DB 1A1 (Ts M10)*	*DB 1A1 (Ts M13)*
Coarseness	M	F	M	M
Sorting	S	S	S	S
Silt	++	+	++	++
Fine sand	--	*	--	-
Sand				
Mica	*	*	*	*
Iron oxide	*	-	*	*
Acca. Minerals	A/P, Z, Mu, Iso	A/P, Z, Mu, Iso	A/P, Z, Mu, Iso, Bi	A/P, Z, Mu, Iso
Plant fragm.		--		
Flint grains	*	*	--	--
Temper				
Type	Nat/lev	Nat/lev	Nat/lev	Nat/lev
Max. grain	0,4 mm	0,5 mm	0,4 mm	0,6 mm

Legend:
F = fine, M = medium coarse, C = coarse
S = sorted, U = unsorted
*-- = very few, - = sparse, * = common, + = rich, ++ = abundant*
O = ore, A/P = amphiboles/pyroxenes (dark minerals), Z = zircon, Mu = muscovite, Bi = biotite, Iso = isotropic material, cp = clay pellets, Fs = feldspars, Fe = iron
Nat = natural, hom = homogeneous, het = heterogeneous

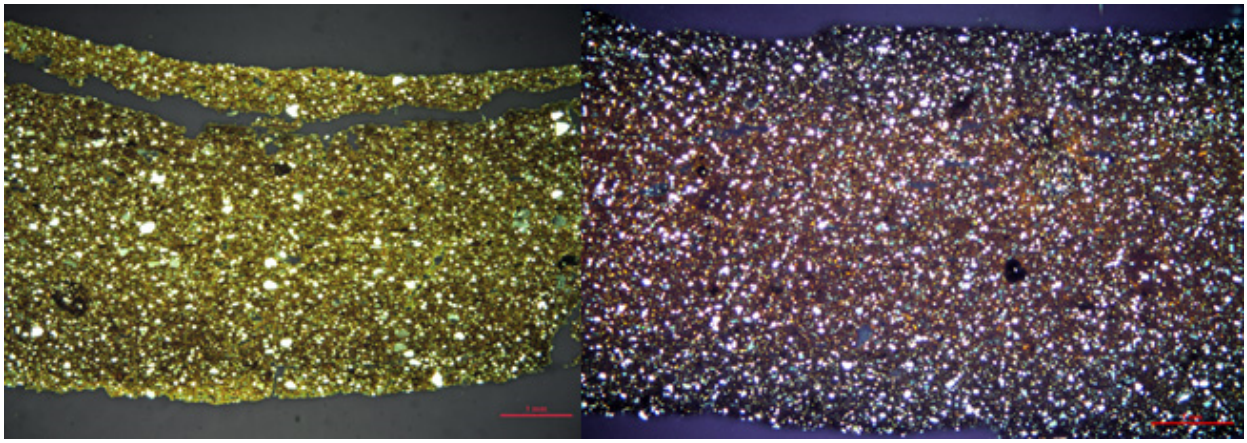


Figure 96 Microscope photo of thin sections: 1 Temse (BE), DB1A. - 2 Castrop-Rauxel/Ickern (Westphalia, DE), C-R/I1. – (Photo O. Stilborg). - Scale bar 1mm.

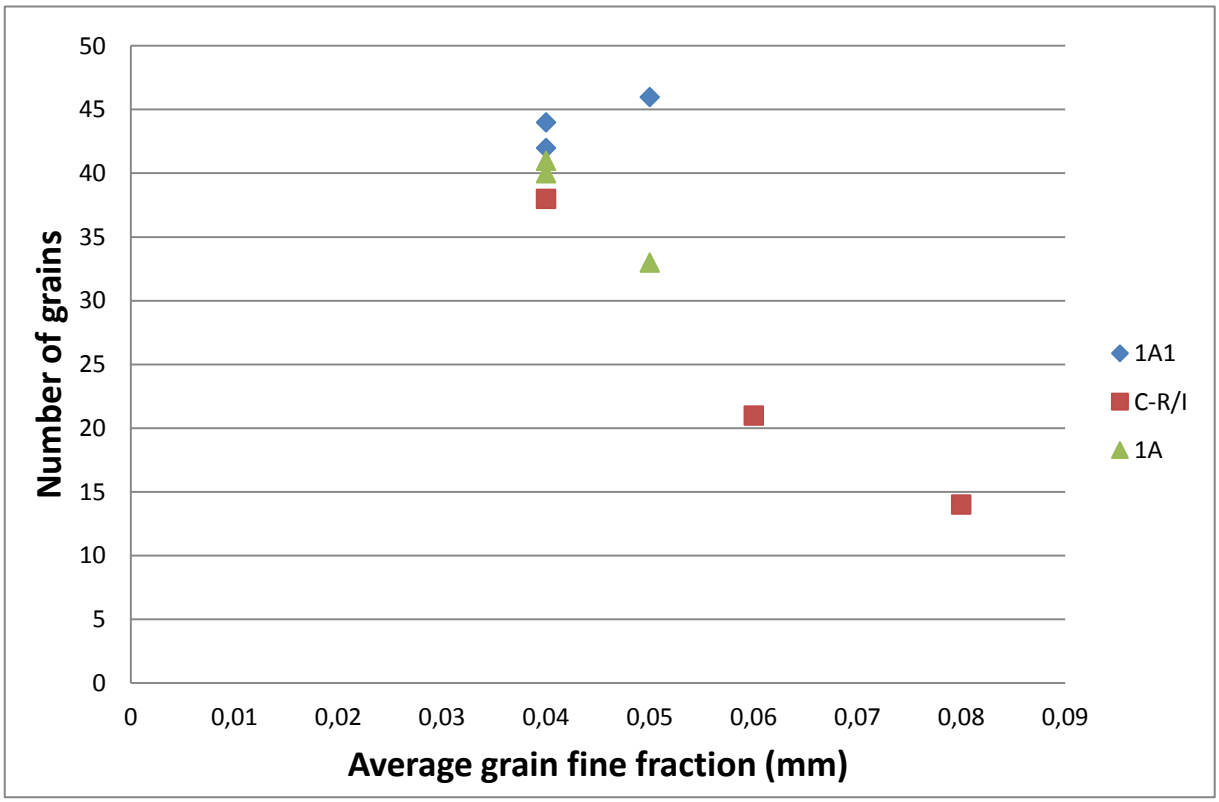


Figure 97 Diagram of the relationship between number of grains and average grain size in the fine fraction of the clays in selected thin section samples from Belgium, the Netherlands and Westphalia.

7.5 Discussion and interpretation

7.5.1 Limitations in identifying production and workshops

The complexity of ceramic materials makes the interpretation of ware variability a difficult task that needs a pre-understanding of the relationship between the different parameters. The variability that may be observed and studied through a range of different archaeometrical methods depends primarily on the geological settings and processes forming the mineralogy and sorting of the clay chosen for the pottery production. The raw material used is always a compromise between the potter's ideal (based on craft traditions) and the clay available within reasonable distance from the production site, even if the potter may have methods to alter the raw material in different ways. The potter may clean the clay to various degrees, mix clays with different properties and add non-plastic temper materials. In the latter cases, geology is most often providing the limits for possible strategies/solutions. In the next stages of the craft, the potter is responsible for adding variability to the ware by mixing and/or homogenising the raw materials, forming the ware, drying and firing. The latter three processes mainly influence grain orientations, void formation and orientation and colour.

These are the basic parameters for all pottery making. When we turn to the professional production using technically more advanced forming methods such as wheel-turning and kiln firing, other constraints are involved. While a small household production of handmade vessels may use a large range of different available clay sources – even small deposits, the professional production prefers larger deposits of the same quality clay in order to secure a continuous output. Furthermore, in the case of wheel-turning, the clay should be well sorted and without larger, sharp edged non-plastics (which could cause tearing of vessel wall during turning). The professional potter/workshop would ideally seek out a sizeable clay bed of the required quality and stick to it as long as possible or alternatively invest in the structures needed to clean the clay using levigation (Peacock 1982b, 54-56, 121, 124; Quinn 2013, 154-156). It is reasonable to assume that this investment will only be made at larger workshops.

Because of these constraints in the professional pottery productions, the variability would appear to be easier to interpret. If the actual workshops are excavated and wasters studied using archaeometry this may well be true. Given good chronological resolution it may also be possible to see changes in the procurement of raw materials and/or

introduction of new techniques such as levigation in course of the production period (Helfert / Stilborg forthcoming). However, left with remnants of distributed and used pots locally produced or imported from unknown sources and therefore without references to graphically delimited, mineralogical differences in the clay deposits, it is a much more difficult task. Studying such a material using any archaeometrical method, we may identify groups of wares that are similar with respect to a range of different parameters (the more the better) and that could very well represent products from the same workshop. As long as wasters from the actual workshop(s) are not analysed, we can only discuss the likelihood of the assumed groups. Most often this grouping will only encompass a minor part of the wares analysed. The outliers might represent other productions and the likelihood of that is again dependent on the number of parameters that deviate. However, we can never exclude the possibility of forced changes of raw material source or introduction of new techniques such as levigation as reasons behind the deviating ware(s). Levigation increases to the difficulty in establishing different productions as it adds yet another unknown parameter. The outcome - the levigated clay - is determined by the quality and mineralogy of the raw clay; the quality of the mixing work in the levigation tank (and mixing of different clays is a possibility as well), the duration of the settling phase, how much clay slurry is extracted at one time and how well the levigated clay is homogenised (kneaded) before being turned into a pot. Furthermore, we need to know (but do not) how large a variation in the quality of the clay was accepted in the workshop production. Only the analyses of wasters from production sites can provide that information. Without knowing the production parameters from a range of workshops, we will have to accept these limitations in the provenance-studies of professional pottery.

7.5.2 Production and consumption of Late Roman terra nigra foot-vessels

The geochemical and petrographic results indicate a complex production process which cannot be explained by a singular model. First, from the chemical analysis it became clear that there is a distinction in the Westphalian (WF) and the Dutch-Belgian (DB) group related to differences in the clay source. Second, the general conclusion derived from the petrographic comparison is the use of levigated clays, which is supported by the chemical results from aluminium and silicon. Whether this levigation is from natural or

anthropogenic origin is not clear, although, it is certain that different clay sources were used to make the Westphalian and the Dutch samples. However, this does not tell us how many workshops or production centres there were, nor their exact provenance. Nevertheless, the similarities in mineralogy, grain size and count between the petrographic Dutch-Belgian group 1 and the Castrop-Rauxel/Ickern group 1 could indicate a shared origin, possibly expressed in the small overlap in the geochemical results. Given that the CR/I group 1 is a small group in the Westphalian material, but the DB 1 is the major group in the Dutch-Belgian material, a possible provenance in the Netherlands or Belgium could be proposed for the CR/I group 1. This is however speculation at this point, although the parallels with Low Lands Ware 1 provides a good provenance candidate. In contrast to these provenance uncertainties, it is clear that there are at least two larger productions present in the Dutch-Belgian area and the Westphalian area, possibly the Hellweg region, based on levigated clays of varying qualities, alongside a number of small productions or imitations. The latter used to some extent natural fine clays with similar characteristics, probably due to the same general geological setting, or had knowledge of the levigation technique to clean the clay.

The differences in production can be interpreted as a matter of scale. Peacock's modes of production (1982) examined the different scales of ceramic production in the Roman Empire and Caple (2006) linked this model to object scale. Most likely, the Late Roman terra nigra foot-vessels are craft products rather than the result of mass-production results (hundreds vs thousands of comparable objects in the archaeological record, Caple 2006 17-18). Craft products can be the result from 'individual' or 'nucleated' workshops, defined as products made principally for exchange or sale and is most likely distributed in an organised fashion. If the Late Roman terra nigra was the result of a 'manufactory', we would expect to see larger numbers of uniform production. One mode for organised production offered by Peacock (1982) is the 'estate and military production', which involves one or more craftsmen making products for an organisation, i.e. the military, a villa-estate, the provincial or state government. This implies an employment by that organisation with access to specialised equipment and facilities. Production organised in such a manner would correspond with the more larger productions indicated by the geochemical results. A scenario can be imagined where former manufactory workers were employed by newly rising estates or military productions in order to serve local or regional needs in the Rhine frontier zone and the surrounding areas (Pers. Communication C. Agricola and O. Stilborg).

Additionally, the 'household' modes have to be considered as well, which is expressed in products on a small scale for domestic use and sale/exchange/gift giving and is undertaken in or near the home. The household aspect might offer an explanation for the isolated, singular and deviating forms for type Chenet 342 in present day Belgium, the Netherlands and France. This would also explain the lack in uniformity or the higher variation in degree of quality in these foot-vessels, compared to the Westphalian examples. In general, the dense distribution pattern along the Rhine, the levigation and general quality of this ware for both types Chenet and Gellep point towards an organised form of production. Whereas the singular finds and sparser distribution outside the Rhine frontier zone and direct hinterland rather indicate household production.

Not much consensus exists on the origin, function and symbolic value of the Late Roman foot-vessels. Both Chenet (1941) and Pirling (1974) considered it a Germanic idea in a Roman body, although the current study presented evidence indicating the possibility for multiple production centres. When the distribution is considered as evidence for a potential origin or provenance source, at least one major production has to be located in the Westphalian region, conform to the Westphalian fabric, outside the Roman Empire. The dense distribution of the Gellep type along the Lower Rhine frontier, the earlier dates and the link with the Von Uslar type pots from the 2nd and 3rd century (Von Uslar 1938) argue for a Germanic origin. Although a link with Iron Age vessels was noted by Chenet (1941, 91), who also remarked that the foot-vessel returned to Gaul somewhere along the 3rd century. The more dispersed nature of the Chenet 342 can be seen to imply that the form was appreciated widely in the larger provincial regions of Northern Gaul. For in the 4th and 5th century, this area is highly influenced by the military and Germanic presence. The Roman military is known for adopting so-called 'barbarian' tastes (Halsall 2007) and military-related and rural groups have different ways of displaying their identity than the civilian and aristocratic groups further south in Gaul, which continued a more traditional Roman lifestyle (Esmond Cleary 2013). These factors can explain the limits of the distribution in a provincial Roman setting. The ethnic origin of the Germanic soldiers is not the point in question, but their service in the Roman army in this frontier area and their particular choices in adopting and adapting parts of the 'Roman' lifestyle provides one explanation for the unclear nature of the pottery studied here. Furthermore, the basic S-shaped form of the vessel is widely used in many cultures over time, such as the Iron Age or Hellenistic Greece, and seems rather an intuitive form for a drinking vessel, although other uses cannot be ruled out at this point. Based on the

lack of a clear association to a specific social or cultural class, an explanation might be found when the foot-vessel is regarded as the hybrid product of merging identities. The longstanding interaction between the different groups in Northern Gaul and adjacent Free Germania in and around the Lower Rhine frontier zone could have developed into alternative social expressions in order to distinguish themselves from other parts of the Roman Empire and Free Germania. For instance, the most valued expression at social interactions could have become the aspect of drinking, in contrast to the contemporary preference of the display of food in the more 'Roman' areas further south (Esmonde Cleary 2013). It can be argued that the social aspect of drinking became tied to these foot-vessels in the course of the 3rd and 4th century and was an intrinsic part of the uniting of different groups present in a multicultural region. After which it became part of the local merged tradition and identity of the larger northern frontier zone, present in all layers of the military and rural-civilian society. This sociocultural change could explain the pattern that we see without having to resort to ethnicity as an explanatory factor.

Furthermore, there is an overlap zone, on both sides of the northern Rhine frontier (cf. Dutch river area) which could indicate that the largest consumption market could be found in the frontier zone, arguing an influence of interaction in the origin and development of the Late Roman terra nigra foot-vessels. This could be related to the rather dispersed distribution pattern away from the frontier zone. Furthermore, if this was a new or renewed tradition in the northern frontier zone, it could also explain the distribution pattern in both ways: either it originated from the Germanic tradition, after which people from the frontier that moved further into the hinterland sought for this foot-vessel to uphold their tradition or association to the frontier area, creating a social need to which the production of existing workshops could have adopted. Such as is perhaps the case for the production in the Argonnen. Or it originated from a Roman provincial tradition from Northwest Gaul, that became popular in the frontier zone and with Germanic soldiers/officers that returned home and inspired a display of status by this vessel, creating a social prestige for the consumption and production of this vessel. The chronology, however, speaks in favour of the first.

To fully understand the value of the Late Roman terra nigra foot-vessels as an indicator of cultural identity or value, it is necessary not only to discover its origin, but also its function and usage. Without knowledge of its place in consumption, there is little way to reconstruct the social and symbolic meaning. Are the foot-vessels perceived as the same objects inside and outside the Roman Empire? Or is this type redefined in function or

symbolism in the second half of the 4th century in northern/northwest Gaul? These questions remain to be answered still, however, the results of this interregional study already contributed to understanding the Late Roman terra nigra as a valuable ceramic ware for understanding the changes in the larger northern frontier zone during the 4th and 5th century (see Chapter 9).

7.6 Late Roman terra nigra: conclusions after the first characterising step

From the interregional fabric, geochemical and petrographic comparison of the Late Roman terra nigra foot-vessels of types Chenet 342 and Gellep 273/274 it can be concluded that not merely one workshop was responsible for the production of this pottery. At least two major productions using different clay sources have been identified, although their provenance remains uncertain. The relation with the fabrics argues a large production in the Westphalian area, possibly the Hellweg region, and another major production in the Dutch-Belgian territory. The comparison with the fabric of the Low Lands Ware points to the Bergen-op-Zoom region as a good candidate, although further study and analyses are required to confirm this. These major productions created wares from a certain quality, evident from the selection of fine clays and the use of levigation and wheel-turning techniques, that indicates the potential function of a table ware In addition to large scale productions, smaller workshops have probably existed as well on the level of a household or a small craft workshop. This also provides an explanation for the handmade foot-vessels with the same general S-shape.

The discussion concerning the consumption of these foot-vessels has less tangible proof than its production, although its distribution, the lack of sociocultural distinction in sites or contexts and the possible function as tableware meant for drinking/dining/feasting argues for a development caused by the merging of Germanic-Roman-military-rural/civilian identities from the 3rd to the 5th century. Furthermore, it can be seen that this hybridisation resulted in a joined 'northern' regional identity of the general Lower Rhine frontier zone, which is connected by mobility, (return) migration to the hinterland on both sides of the borders. Additionally, a change in *mentalité* in the Late

Roman period could have caused the emergence of expressions that resembled new or traditional ways in which the multicultural society of this region could distinguish themselves from the other parts of the Roman Empire and other people of Free Germania.

8

Changing display of status: rise of the military elite based on evidence from the Low Countries crossbow brooches

The content of this chapter will be partly published as a chapter in the upcoming ***Amsterdam Archaeological Studies*** *(Van Thienen in press) and the analytical results are submitted to the* ***Journal of Archaeological Science*** *(Van Thienen and Lycke).*

Van Thienen (in press) A Symbol for Late Roman authority revisited. A socio-historical understanding of the crossbow brooch, in Roymans, Heeren and De Clercq: Social Dynamics in the Northwest Frontiers of the Late Roman Empire. Beyond decline or transformation.

Van Thienen and Lycke From commodity to singularity: the production of crossbow brooches and the rise of the Late Roman military elite, is submitted to Journal of Archaeological Science..

In this chapter, we will examine a third and final case study of material culture in Late Roman northern Gaul. In total, a sample of 185 crossbow brooches from 12 sites in Belgium and the Netherlands were collected, referred to as the 'Low Countries crossbow brooches' (Figure 98), and studied with an interdisciplinary approach. We will start with a state of the research by reviewing past studies, typological models and the existing interpretations for the production and social interpretation of the crossbow brooch. Followed by outlining the general aims and methods. The investigation into the life of the crossbow brooch starts with a complete cultural biography (3rd to 7th century), examining all available iconographic, historic and archaeological records connected to the crossbow

brooch and will focus on contextual changes. Next is the stylistic evaluation of the Low Countries crossbow brooches to understand change and variation of the objects themselves in relation to typology and chronology (3rd to 5th century). Finally, before coming to a conclusion on the production and consumption of the crossbow brooch in Northern Gaul, we will explore the characteristics of the composition and dimensionality of these brooch types in order to contribute to the current production model.

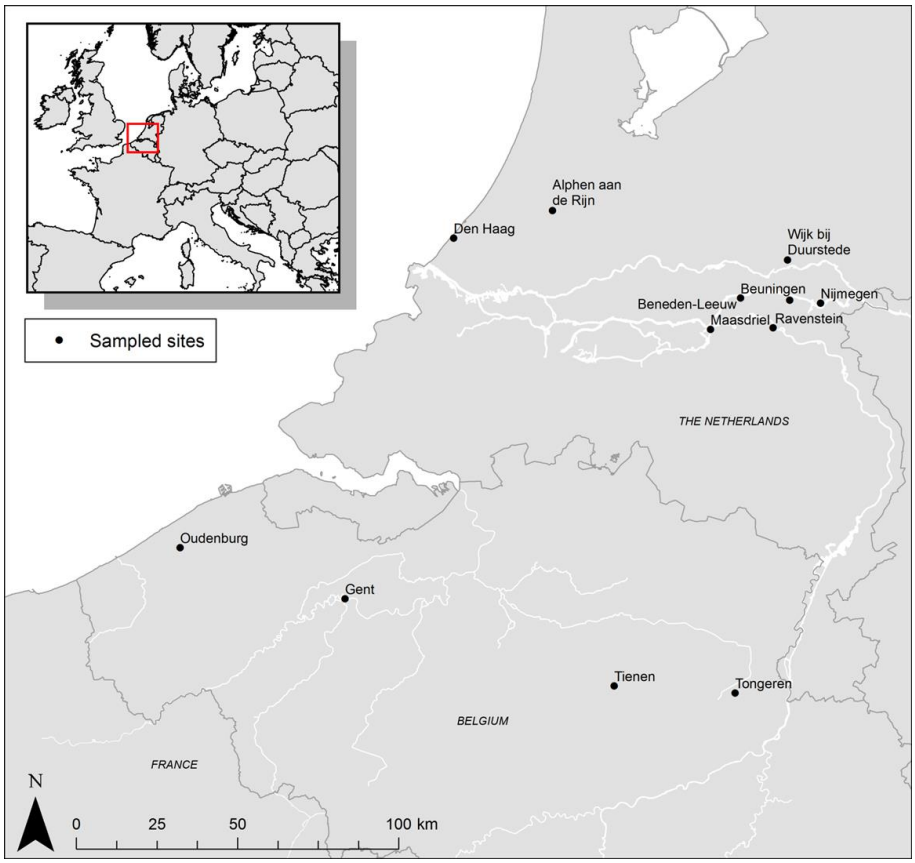


Figure 98 The geographical location of the sites from which crossbow brooches were sampled in the region of northern Gaul, corresponding with present day Belgium and the Netherlands.

8.1 Introduction: the state of research

The crossbow brooch (Figure 99) is one of the most iconographic Late Roman objects. The golden and silver brooches of this type are highly valued for their splendour and their often outstanding decorative techniques. Their inclusion in depictions of important historical figures and on monuments from Late Antiquity only adds to their reputation as

elite Roman symbols. The full story of the crossbow brooch is much more complex, however. What started out as a simple copper-alloy-based functional object became one of the most compelling symbols of Roman power. These objects were found in every province throughout the Roman empire between the 3rd and 6th centuries AD. Despite its prominent place in iconography, there are no known antique historical sources that directly discuss the significance of this artefact, its owners or the reason for its importance.

Figure 99 Crossbow brooch from burial 37 near the Roman fort of Oudenburg, Belgium (Swift type 2iii, 4th century AD). Currently in the collection of the Roman Archaeological Museum in Oudenburg. (Photograph V. Van Thienen).

8.1.1 General studies and models

Crossbow brooches first appeared in archaeological studies in the first half of the 20th century (Behrens 1919; Almgren 1923; Kovrig 1937; Van Buchem 1941; Von Patek 1942; Heurgon 1958). Early scholars began to discover the dating capacities of brooches and created general brooch typologies and extended catalogues, such as Almgren's (1923) extensive work on brooches found in northern Europe. In those early works, the main discussion centred around the nature and origin of brooches, in keeping with the ethnic interpretation discourse of that time (for an overview, see Van Buchem 1966, 61 and 99 note 18).

In the second half of the 20th century, research on the crossbow brooch developed as the number of finds increased, mainly from excavations in the northern and western provinces of the Roman Empire. Most studies were regional studies (Van Buchem 1941; Keller 1971; Ettlinger 1973; Böhme 1974b; Feugère 1985; Hull and Hawkes 1987) or artefact catalogues from particular sites or excavations (Van Buchem 1966; Böhme 1972; 1974a; Jobst 1975; Clarke 1979; Riha 1979). Many of them were carried out in different countries

at about the same time, creating many typologies (Figure 100), which led to some degree of methodological and descriptive variation.

While most of these early scholars were already treating the crossbow brooch as a specific type within their brooch classifications (Böhme 1972; Ettlinger 1973; Jobst 1975), the first detailed typology was not created until Van Buchem identified five different groups, based on style and shape (Van Buchem 1941; Van Buchem 1966). Although Van Buchem presented additional information on related iconographical sources and brooches with inscriptions, the international reach of his model was fairly limited. The most influential work was produced by Keller in 1971, whose typology consists of six successive types, based on well-dated burial finds from *Pannonia*. Many scholars preferred to use Keller's model rather than create independent typologies (a summary is given in Swift 2000, 13). Despite the model's success, some scholars made regional and chronological adaptations to compensate for Keller's lack of regional variation (Riha 1979; Feugère 1985). The main adjustments were made by Pröttel (1988), who refined the chronology and merged two separate – often indistinguishable – subtypes into one (type 3 and type 4 becomes type 3/4). Swift revised Pröttel's adjustments and refined the subdivisions, based on a larger, interregional comparison (Swift 2000, 13-88) (Figure 100, Table 18). In addition to an elaborate study of regional variations across many western Roman provinces, Swift also introduced a non-linear evolution model for the lifespan of the crossbow brooch, illustrating the existence of chronological overlap (Figure 101).

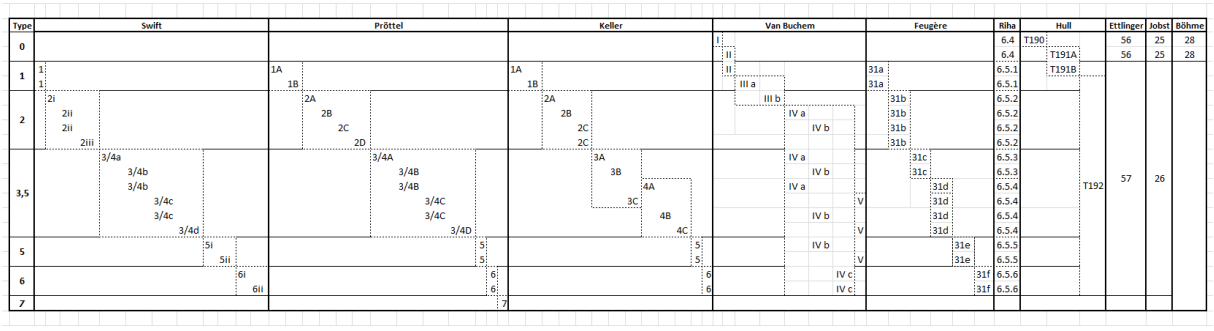


Figure 100 The crossbow brooch typology used in this study based on the model of Keller-Pröttel-Swift, with the introduction of 'type 0' to incorporate the direct predecessor. The models of Van Buchem (1966), Feugère (1985), Riha (1979), Hull and Hawkes (1987), Ettlinger (1973), Jobst (1975) and Böhme (1972) are added as comparison.

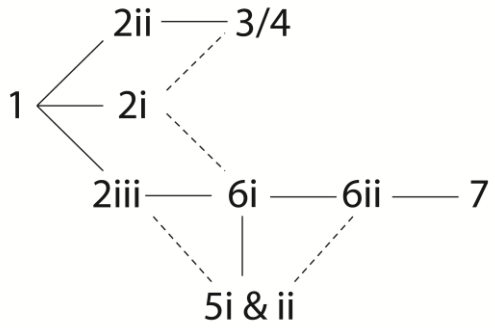


Figure 101 Evolution of crossbow brooch typology (Swift 2000, 27).

Table 18 Typology used in this study with direct comparison and dating from Swift's model (2000) (Type 7 is not relevant in this study).

Type	Model	Date (AD)
0		< 280
1	1	280-320
2	2i 2ii 2iii	300-365
3/4	3/4a	325-355
	3/4b	350-410
	3/4c 3/4d	330-410
5	5i 5ii	350-415
6	6i 6ii	390-460
	7	*460-500*

These models still contain some blind spots, however. Firstly, they tend to focus mainly on the 4th century, rather neglecting both the initial development and the end phase of the crossbow brooch. Secondly, these typological models are mainly based on stylistic differences, resulting in assumptions about provenance and production based on little solid evidence. Thirdly, the object's transformations are only considered from a typological point of view. This makes it difficult to track changes over time rather than between subtypes, despite the chronological evidence gathered from archaeological contexts. And lastly, the occasional uncritical use of references to historical and art historical evidence has created rather undifferentiated ideas about the use and social significance of the crossbow brooch, as will be discussed later on (see 8.2).

To overcome these blind spots, more recent studies have gradually been adding information to these models on three major levels. The first level concerns the general distribution of the brooches, which has benefited from better knowledge of crossbow brooches from the northern and western provinces. Most new studies consist of case studies or collection catalogues from previously unstudied sites or regions. The inclusion of the eastern provinces in the Black Sea area has proven very valuable (Soupault 2003; Chiriac and Nuţu 2012; Lafli and Buora 2012), but so too has the addition of some overlooked regions in the western provinces, such as sites in Spain, Italy, Germany and Belgium (Buora 1997; Aurrecoechea 2012; Van Thienen and Vanhoutte 2012; Buora 2013; Pauli 2013). More valuable studies have been undertaken in the Balkan area, such as the work of Petković (2010), based on finds from Serbia, in which she assigns detailed chronologies to specific subtypes and links these to presumed workshops. The second level attempts to address previously neglected questions, such as the initial and final developments of the crossbow brooch. A recent study on the finds from Augsburg focused on 3rd-century developments (Pauli 2013), while another study from the Metropolitan Museum applied an art historical approach to consider the final stages in the transition between Late Roman and early Byzantine times (Deppert-Lippitz 2000). The third level focuses on technological issues of production and composition by gathering 'solid data' from scientific analyses (Bayley and Butcher 2004; Giumlia-Mair, De Cecco and Vitri 2007). Although this method holds considerable promise for our ability to come up with new answers, it has not yet been widely applied to the crossbow brooch. Compositional analyses can result in independent groups that modify existing technological and production models based on stylistic and typological analyses. However, unless we excavate specific workshops or study direct manufacturing evidence, it will be difficult to make further significant progress in locating production centres.

8.1.2 Knowledge of production and distribution

As well as creating typological models, scholars have sought to resolve technological questions about the production and manufacturing processes for crossbow brooches. Early scholars made their first insights by examining how Roman brooches were made and used (for example Riha 1979, 12-18). The brooch mechanism was quickly understood, as well as the manufacture and assemblage process, but the exact nature of production and composition was less obvious. Initially, the majority of crossbow brooches were

recognised as bronzes, although there was more interest in the gold and silver examples, along with the various decorative techniques (Bayley and Butcher 2004, 12-25, 106-120). Since very little metal-working evidence specific to the crossbow brooch has been found, scholars have relied mainly on stylistic evidence to address questions of production and distribution (a short summary is given in Swift 2000, 3). Based on their largely similar shape and supposed official nature, scholars soon suggested that the brooches must have been made at a major state-run central production site (Riha 1979, 171). The large number of finds and the references to the *fabricae* in the *Notitia Dignitatum* support the claim concerning a central production site in *Pannonia*, although some authors have argued for regional variations, thus suggesting there may have been regional production centres (Jobst 1975; Clarke 1979).

The interregional comparison by Swift (2000, 29-81) demonstrated that the crossbow brooches' evolution is shaped by regional dynamics, chronological overlap and changing production processes. She created a new narrative of a continuing mainstream trend that achieved a wide distribution beside parallel smaller divergent groups with a regional character and restricted spread. Evidence was proposed to support the presence of workshops in northwest Gaul and the Danubian provinces for the early 4th century (types 1 and 2) with limited distribution clustering along the frontier zone. For the largest part of the 4th century, the *Pannonian* production (type 3/4) dominated with a wide spread across the entire Roman Empire, until this production ceased at the end of the 4th century, possibly due to the collapse of the frontier and the corresponding abandonment of the military facilities. At this point, small workshops in the area west of the Rhine continued production into the 5th century (types 5 and 6), characterised by a distribution away from the frontiers and changes in symbolism resulting in a higher status expressed in the increased use of gold.

The copper alloy nature of these Roman brooch types has only been clarified more recently by compositional studies, of which the most relevant is the analytical study of. Bayley and Butcher (2004) on the compositional characteristics of the Richborough Collection. Despite that it was not their aim to identify production centres specific to the crossbow brooch, their general results confirmed Swift's model a-on a regional level. In addition, Swift applied the analysis performed by Bayley (1992) in her research, yet she could not go beyond distinguishing between a possible British or Continental origin, due to the lack of comparative compositional analyses. Additional evidence of small scale localised production was found in a workshop in Socchieve (northeast Italy) in a short

case study on a number of crossbow brooches and a possible imitation type (Hrušica brooch) (Giumlia-Mair, De Cecco, Vitri 2007).

Apart from these two analytical studies, there is not much direct evidence available as yet to aid the interpretation and localisation of production centres. To improve production models for the crossbow brooch, more analytical studies are needed that will enable the comparison and identification of compositional groups. This study aims to do so (see 8.4) and calls future studies to consider this as well.

8.1.3 Social and historical interpretation

Just as important as matters of technology are questions on how to understand the crossbow brooch in its social and historical context. The first scholars to study the crossbow brooch believed it to symbolise the growing 'Germanic' presence or influence in the Late Roman army and Empire (Almgren 1923; Kovrig 1937; Von Patek 1942; Heurgon 1958; Van Buchem 1966; Böhme 1972; Böhme 1974). This view was dismissed once it became evident that it was a genuine Roman item, part of the *chlamys* costume (for a comprehensive explanation about the chlamys costume, see Parani 2007, 500-505). The association with the army remained, since most brooches were found in or near military contexts and burials. Most scholars quickly associated crossbow brooches with elite status, due to a combination of the art historical evidence of high-ranking officers (e.g. Stilicho) wearing such brooches on their shoulders and historical references linking them to the imperial sphere (Heurgon 1958, 23). This discussion about interpretation developed into a debate about their being restricted and available to various social positions, and possible exclusively to the military, as well as their economic and symbolic value (Keller 1971, 27; Jobst 1975, 93; Clarke 1979; Swift 2000, 3-4).

While many scholars added a range of views to this general debate, certain ideas were readily accepted based on the combined archaeological and art historical evidence. These observations led scholars to conclude that the crossbow brooch was intended to be worn only by men, fastened at the right shoulder[18] of the cloak and with the foot pointing

[18] Although archaeological evidence from certain burials shows the crossbow brooch fastened at the left shoulder, which can be explained by considering that it needed to be fastened on the sword arm side (Swift 2000, 4).

upwards. It later emerged that the brooch had not been available to all members of society but was most likely the preserve of the military and administrative elite. By the end of the 20th century, it was agreed that crossbow brooches should be regarded as military objects that had influenced civilian official dress as a result of the political and social ascendancy of high-ranking soldiers and the growing role of the military in the administration. It should therefore be interpreted as a signifier of Roman authority, a claim to membership of the Roman army or administration (Swift 2000, 232; Parani 2007, 501-503).

In view of a three-century lifespan for the crossbow brooch as an active artefact, albeit subject to many regional and chronological variations and changes, the general interpretation as stated above fails to fully capture the full complexity of the brooch's evolution. Some more recent studies have attempted to tackle this issue. Deppert-Lippitz (2000, 42-62), for instance, has made some valid reassessments from an art historical perspective, based on a specific selection of golden brooches and the iconographic evidence. Although the few examples she discusses originate from across the Empire, and range from the early 3rd century to the 6th century, her selection is clearly biased towards the more exceptional brooches. With this in mind, her interpretation should not be understood as a typological model in an archaeological sense and should therefore not be extrapolated to the entire range of crossbow brooches. Recently, Petković (2010, 121-124) associated certain subtypes with different groups of owners, as implied by their manufacturing quality and archaeological context (in Gamzigrad, Serbia). It is claimed that specific subtypes belonged to members of the imperial army and administration, while others with a seemingly undefined official character most likely belonged to the military units stationed at the discovery site. Apart from these attempts, most researchers still use an undifferentiated interpretation of Roman (military) authority, with little regard for chronology, regional differentiation or context.

Some general remarks can be made to caution against the unquestioned acceptance of art historical and historical references. In many cases, art historical examples are simply cited to illustrate a specific point, with little consideration of their wider context or related evidence from artefacts, monuments and architectural decoration, each with their own contemporary value and function in society. Similarly, most of the historical references cited consist of inscriptions or texts mentioning brooches or the cloaks associated with crossbow brooches (*fibula* and *chlamys*). None of these references discuss

crossbow brooches directly, but mainly focus on the value of dress attributes and the regulations surrounding military and official dress, as will be discussed further on.

When studying an artefact type with a significant social and cultural impact, it is important to pay equal attention to the full contextual information. This will be attempted in this study and will be achieved by combining archaeological, art historical and textual evidence. The aim is to enable an appreciation of the evolving meaning of crossbow brooches.

8.1.4 Aims and methods: an integrated approach

To understand the significance, perception and impact of highly evolved objects such as the crossbow brooch in the best manner possible, it is necessary to study each aspect of that object equally and contextualise each phase in its life cycle to their own right, without prejudice to a specific period or region and without bias as to which approach would create the best results. Of course, this is nearly impossible, although this study of the crossbow brooch starts with that intend and aims to consider all available evidence to the fullest. The archaeological, historical and art-historical setting will be taken into account, alongside the archaeometrical results from the chemical and metric analyses and are interpreted within an anthropological framework focussing on the sociocultural processes connected to production and consumption in the complex stratified state-society that is the Roman Empire.

Although each part is considered equally, this chapter will be broken down into three main complementary parts. The first part takes a biographical approach towards object-based material culture to contextualise the archaeological evidence from the Low Countries crossbow brooches for the 3rd to the 5th century within a wider framework delivered by gathering iconographic and textual evidence for the 3rd to the 7th century from all over the Roman Empire. The purpose is to contribute to the debate on the social and historical contexts of the crossbow brooch by tracking the changing series of meanings attributed to this artefact type. The second part consists of a detailed stylistic evaluation of the Low Countries crossbow brooches by creating a profile of the (micro)regional variation and change in style in relation to typology and chronology. This section explores the value of changes in size in addition to the more traditional aspect of comparing style and shape in order to contribute to the discussion on production and sociocultural context. The third part deals with the archaeometrical aspect of the story,

elaborating shortly on the details of the applied analytical techniques, as well as focusing on variation in the physical nature of the artefact. Change in composition and dimensionality are used in order to interpret change in the production of the crossbow brooch from the 3rd to the 5th century.

After careful consideration of each discipline and investigating processes of regionality, state-control and expression of identity, the findings of these three parts are accumulated to review the consumption and production of the crossbow brooch and the growing influence of the military elite in Late Roman Northern Gaul.

8.2 The cultural biography of the crossbow brooch[19]

8.2.1 The biography of an artefact type

In order to expand our traditional interpretation of the social and historical context of the crossbow brooch, we should consider alternative approaches to these matters in material culture. To this end, the present study applies the concepts of cultural biography as formulated by Kopytoff (1986) in his cultural biography of things.

In Kopytoff's view, a biography of things explores the origin of an object, its life and ending; it looks at who made it and at its perceived ideal life (Kopytoff 1986, 66-68). It also investigates possible cultural markers present in the object and attempts to recognise phases in the thing's life and how usage changes with age. What makes the biography of the object cultural is the perspective from which it is studied: a culturally-informed biography considers an object as an entity, made and defined by a culture and assigned to a certain class or group created by that culture.

The cultural biographical approach can be used for a single artefact, but also an object class or type. In material culture studies, artefacts can be considered as a palimpsest, in the sense that they have evolving meanings over time (Caple 2006, 7). The same is true for complete artefact types. The related approach of life-cycle assessment is useful for our purposes. Dannehl (2009) suggests the combined use of life-cycle mapping, which tracks

[19] This part of the chapter will be published in the upcoming Amsterdam Archaeological Studies.

an object's life from beginning to end, and object life stories, which study the transformation of an object through varying contexts. In this way, a narrative can be created by stringing multiple biographical moments together to present a generalised biography covering the entire lifespan of the complete artefact type.

Relevant questions based on the object biography could include: When did the crossbow brooch first become recognisable with a specific function and meaning, and when did it stop fulfilling its purpose and fall out of use? How did it change, or vary, and what did these changes or variations signify? How is its transformation related to the varying contexts and why did these transformations occur?

The cultural biography of the crossbow brooch presented below considers the full extent of the changing symbolic and social values of this artefact type. The main indicator for change employed the variation in the different kinds of contexts throughout its life cycle. This includes shifts in the archaeological and iconographic contexts in which the crossbow brooches are found, as well as the changing topics and associated people mentioned in inscriptions and illustrations.

8.2.2 Iconographic evidence

We can start this cultural biography by reviewing the available art historical evidence in chronological order (Table 19). The dating of the artworks, sculptures and monuments discussed below is determined through art historical research, and it is stressed, that to the best of our knowledge these dates were established independently of the depicted crossbow brooches and are unrelated to the archaeologically attested types and dates.

Table 19 Art-historical evidence with depictions of crossbow brooches, arranged chronologically and divided into phases linked to the corresponding style and imperial dynasty.

Phase/Style	Iconographic evidence	Description	Date	Location
Tetrarchy - Constantinian dynasty	Funeral monument Tilva roš	Part of a funeral scene	280-320	Bor, Serbia
	Frieze of Constantine	The campaign against Maxentius	312-315	Rome, Italy
	Lateran Sarcophagus	Scenes from the Old and New Testament	315-325	Rome, Italy
	Dogmatic Sarcophagus	Scenes from the Old and New Testament	320-330	Rome, Italy
	Sarcophagus of Marcus Claudianus	Early Christian scenes	330-335	Rome, Italy

	The Great Hunt mosaic	The hunt, capture and transport of animals	310-340	Piazza Armerina, Sicily
	Silistra Tomb fresco	Servants carrying clothes to the heads of the family	350-380	Silistra, Bulgaria
Theodosian dynasty	Projecta Casket	Woman and man appearing in a wreath	350-380	London, England
	Brescia Casket	Pontius Pilate washes his hands of Jesus	380-400	Brescia, Italy
	Missorium of Theodosius	Theodosius with Valentinian II and Arcadius	± 380	Madrid, Spain
	Theodosius obelisk pedestal (relief 1)	Theodosius offers laurels of victory	± 390	Constantinople, Turkey
	Theodosius obelisk pedestal (relief 2)	Barbarians bringing gifts to Theodosius	± 390	Constantinople, Turkey
	Carrand Diptych	Adam in paradise and scenes from the life of St Paul	± 380-400	Florence, Italy
	Consular Diptych of Stilicho	Consular diptych of General Stilicho and his family	395-408	Milan, Italy
	San Gennaro fresco	Theotecnus with wife Ilaritas and child Nonnosa	400-600	Naples, Italy
	Consular Diptych of Rufius Probianus	Vicarius Probianus with two secretaries/officials	± 400	Berlin, Germany
	Halberstadt Diptych	Consul with two secretaries	± 417	Halberstadt, Germany
	Diptych of a Patrician	Prominent figure dressed in a *chlamys*	± 425	Ravenna, Italy
	Felix Diptych	Patrician holding codicil	± 428	Paris, France
	Astyrius Diptych	Official consul position	± 449	Darmstadt, Germany
Leonid - Justinian dynasty	Consular Diptych of Areaobindus	Consul with two secretaries; scenes of the games	± 506	Zürich, Switzerland
	Santi Cosma e Damiano mosaic	Saint Theodore	± 530	Rome, Italy
	Barberini Diptych	Triumphant emperor	± 540	Paris, France
	San Vitale mosaic	Justinian and Theodora	547	Ravenna, Italy
	Maximian Chair?	*Joseph scenes*	*545-553*	*Ravenna, Italy*
	St Apollinare Nuovo mosaic	Christ stands before Pilate	561	Ravenna, Italy
Heraclian dynasty	Virgin and Child icon	Virgin and Child with angels and saints	± 600	Mount Sinai, Egypt
	David plates (1)	David before Saul	628-630	Karavas, Cyprus
	David plates (2)	Marriage of David to Michal	628-630	Karavas, Cyprus

Hagios Demetrios mosaic (1)	Saint Demetrius with two dignitaries	± 650	Thessaloniki, Greece
Hagios Demetrios mosaic (2)	Companion saint of Demetrius, protecting two children	± 650	Thessaloniki, Greece
Hagios Demetrios mosaic (3)	Companion saint of Demetrius with dignitary	± 650	Thessaloniki, Greece

From the 4th century onwards, crossbow brooches featured in a wide range of artworks, such as sculptures, mosaics and frescoes. One of the earliest known examples is the 'Great Hunt' mosaic from one of the corridors of the Villa del Casala at the Piazza Amerina (Sicily) (Kitzinger 1977, 9; Pensabene and Gallocchio 2011, 31-33). This mosaic contains several illustrations of crossbow brooches (Figure 102). The clearest example can be found on a Roman soldier or officer, on horseback amid a tiger hunting scene. Less clear are two other examples: one on a man with a '*Pannonian* hat', who is associated with the ownership of the villa; another on the shoulder of the presumed conductor of the hunt, a bearded man, again displaying a '*Pannonian* hat' (Kitzinger 1977, fig. 6). These three illustrations have been found by examining pictures and drawings of the mosaic, although it is possible that there are more present in this extensive scene. The mosaic's construction is dated to the Constantinian period (ca. AD 310-340) and the villa owners are believed to have belonged to the senatorial class (Pensabene and Gallocchio 2011, 35).

Figure 102 Selection of figures from the Great Hunt Mosaic from the Roman villa del Casala at the Piazza Armerina (Sicily). Top right: a Roman soldier or officer on horseback at a tiger hunt. Left and bottom right: presumed owners of the villa with 'Pannonian hats'(after Pensabene and Gallocchio 2011, 32).

The combined appearance of the crossbow brooch with the '*Pannonian* hat' is an interesting, recurring aspect. It also occurs on the Arch of Constantine, for example, where the scene of Constantine's advance from Milan, on the left of the west side relief (profectio), shows at least two men in the supply train with both a brooch and hat (Elsner 2000, 165-172; Clarke 2003, 60-62). The surrounding, similar figures are too weathered to confirm the presence of brooches on their shoulders. This specific relief is attributed to 4th-century workshops, placing it around AD 315 (Weitzmann 1979, 399). An additional example is the funeral sculpture from Tilva roš (Serbia) (Figure 103) (Petković 2010, 131, fig. 126). This relief of two men and their assumed wives is dated to the transition from the 3rd to the 4th century. Both style and date point to the same art style as the previous examples.

Figure 103 Detail of the Arch of Constantine, displaying the crossbow brooch/'*Pannonian* hat' combination.

The number of examples increased in the first half of the 4th century with the introduction of early Christian sarcophagi, more specifically, the frequent representation of the 'Arrest of St Peter'. This scene often includes two soldiers with the brooch-hat combination. Well-known examples are the Lateran (sometimes referred to as Sabinus sarcophagus) and Dogmatic sarcophagi, respectively dated to AD 315-325 and AD 320-330, which are believed to have been made in the workshop that produced the Constantinian friezes (Kitzinger 1977, 22-24; Weitzmann 1979, 398-399; Evans 1993)(Kitzinger 1977, 22-24; Weitzmann 1979, 398-399, Evans 1993). Similar examples are the sarcophagus of Marcus Claudianus, the Husband and Wife sarcophagus and sarcophagus Vat 31578

(Figure 104)[20]. Although many more sarcophagi depict the Arrest of St. Peter, they rarely feature the brooch as part of military dress and may therefore be attributed to different workshops than the ones mentioned above.

Figure 104 Detail from sarcophagus Vat 31578, depicting the 'Arrest of St. Peter'. This scene often shows both men at Peter's side wearing the crossbow brooch/'*Pannonian* hat' combination.

In addition to funerary sculptures, tomb frescoes can also be worth investigating. The Silistra tomb fresco in Durostorum (Bulgaria), for instance, shows two crossbow brooches. The first is worn on the shoulder of the master in the centre of the scene (Figure 120), while the second is fastened onto a cloak held by a servant (Figure 105). The master in the scene is thought to have been a Roman patrician belonging to the high military aristocracy. This is evident from the nature of his dress, the red colour of his cloak and the presence of a codicil. The paintings in the tomb are dated to AD 350-380 (Atanasov 2007, 449-454)(Atanasov 2007, 449-454). An additional example is the family portrait of Theotecnus, located in the catacombs of San Gennaro in Naples (Italy). Despite the uncertainty surrounding Theotecnus' social position and the date of the tomb, his wealthy attire and the location of the family tomb suggest that he was a member of the

[20] These examples were found by consulting the Divinity Library from the Vanderbilt University, consulted in February 2015 by the author: http://diglib.library.vanderbilt.edu/

patrician or senatorial class (Lioce 2013, 34-38). Although the tomb itself cannot be dated more accurately than within the 5th and 6th centuries, a date at the beginning of the 5th century might be proposed, based on style and dress properties.

Figure 105 Part of the Silistra tomb fresco. A servant brings a cloak to his master with a crossbow brooch already attached (after Atanastov 2007, 465).

Before moving on to the 5th century, we should consider a new medium for crossbow brooch illustrations. Indeed, by the second half of the 4th century the brooches no longer appeared solely on architectural decoration or monuments; they also began to emerge on portable objects. The earliest known example is the image of a couple encircled by a marriage wreath on the lid of the Projecta Casket. The husband (Secundus) wears a very clear illustration of the brooch (Figure 163). Despite the couple's uncertain identity, a general date of AD 350 to 380 is accepted for this toiletry item (Van Buchem 1966, 53; Cameron 1985, 135-145; Shelton 1985, 147-148). A comparable object is the Brescia Casket, although it served a different purpose. The lid depicts a New Testament scene, in which Christ is brought before Pilate for judgement (Figure 121). Pilate and six Roman officials are each shown with brooches. The style of the casket, which was presumably produced in Milan, places it around AD 380 to 400 (Van Buchem 1966; Weitzmann 1979, 597-598; Watson 1981, 292-293).

Figure 106 Detail of the Missorium of Theodosius. On the left side of the fracture is a Roman official being handed a document by Theodosius. The unidentifiable official is illustrated with a crossbow brooch on the right shoulder (origin and permission: catalogue of the Museo Nacional de Arte Romano, Inventario CE37652, property of the Ministerio de Cultura, http://ceres.mcu.es/pages/Main).

Around the same time, the Missorium of Theodosius was made to commemorate the *decennalia* of Theodosius in AD 388 (Figure 106). The image on this silver disc shows the emperor Theodosius with Valentinian II and Arcadius at his side (Kitzinger 1977, 31-34; Weitzmann 1979, 74-76; Kiilerich 2000, 278). The brooch in the scene is worn by an unidentifiable Roman officer receiving a diptych from Theodosius. Closely related to the Missorium are the reliefs on the base of the obelisk of Theodosius at the Hippodrome of Constantinople (erected around AD 390). Two of the reliefs include figures wearing crossbow brooches. On one side, Theodosius is depicted with his family in the imperial box and his retinue alongside, with two *chlamys*-wearing high members of court positioned in front of the soldiers on the left-hand side. On the other relief, the emperor is looking out of the imperial box, surrounded by the court and his bodyguard. Here, the younger looking figure on Theodosius' right is the one sporting a crossbow brooch (Kitzinger 1977, 32-34; Elsner 1998, 75-78).

The transition to the 5th century marks the rise of consular diptychs as a popular attribute among the Late Roman political class. Many crossbow brooch illustrations can be found on these diptychs, due to the stylistic choice to portray figures in contemporary attire and with contemporary dress attributes. A famous example is the Monza diptych

of Stilicho and his family, dated to AD 395-408 (Van Buchem 1966, 78). Diptychs were usually commissioned by private citizens and were used as political instruments, often sent out as gifts. Although the diptychs showed consuls in their official capacity, the primary focus was the functions performed during their consulship, rather than the person performing them (Olovsdotter 2003, 212-218; Eastmond 2010, 745). The themes and attributes on these diptychs thus have an official character, as is also evident from the Probianus diptych (ca. AD 400) (Figure 123), Halberstadt diptych (ca. AD 417), Patrician diptych (ca. AD 425), Felix diptych (ca. AD 425) and Astyrius diptych (ca. AD 449) (Van Buchem 1966, 54; Kitzinger 1977, 35, 47; Weitzmann 1979, 55-58; Deppert-Lippitz 2000, 61; Olovsdotter 2003, 19-25; Parani 2007, 503). They all display one or multiple brooch illustrations. The Carrand diptych (AD 380-400) (Figure 122) appears to be an exception as it portrays scenes from the life of St Paul. However, the figure wearing the crossbow brooch is believed to be Publius, a princeps of Malta (Van Buchem 1966, 55; Gosserez 2005, 109-126). Thus, the brooch has to be seen as indicating the official nature of Publius' office, rather than being part of the religious theme of the scene. Although crossbow brooch illustrations seem to have disappeared altogether from diptychs in the 5th century, some examples are still known from the 6th century. The diptych of Areaobindus, dated to AD 506, shows two men with crossbow brooches flanking the consul (Olovsdotter 2003, 37-44; Eastmond 2010, 743-745). The Barberini diptych (Figure 107) is dated even later, to around AD 540 (Kitzinger 1977, 96-97). The difference in date and style of these last two might be attributed to a change from western to eastern Roman workshops (Olovsdotter 2003, 7-8).

Figure 107 Detail of the Barberini Diptych from the left part of the panel (origin and permission: Department of Decorative Arts: Early Middle Ages, Louvre, http://www.louvre.fr/en/oeuvrenotices/leaf-diptych-emperor-triumphant).

The art historical evidence from the 5th century is dominated by diptychs, while the 6th century again saw an increase in crossbow brooch illustrations in architectural decoration – more specifically, in apse mosaics in churches. The mosaic in the San Vitale in Ravenna (Italy) depicts Justinian and Theodora with their respective courts and the Archbishop (Figure 108) and is dated to AD 547. A total of five members of court are wearing a brooch on their *chlamys* (Kitzinger 1977, 87; Weitzmann 1979, 76-78; Barber 1990; Bassett 2008). A second example of an apse decoration can be found in the Santi Cosma e Damiano in Rome (Italy), showing a number of saints and dated around AD 530 (Figure 125). The brooch is illustrated on the (military) Saint Theodore, who had supposedly lived or served under the reign of Diocletian (Kitzinger 1977, 92; Deppert-Lippitz 2000, 61-62; Cochran 2013). A third example is found in the St Appolinare Nuovo in Ravenna (Italy), which portrays the familiar scene of Christ being led before Pilate. The mosaic is dated to AD 561. Pilate is adorned with a crossbow brooch and possibly the figure behind him as well, although that is rather unclear (Deliyannis 2010, 153-158).

Figure 108 Detail of the apse decoration from the San Vitale (Ravenna, Italy), showing Justinian with the imperial court. Three men alongside the Emperor are wearing a crossbow brooch (origin and permission: Artstor library, Emperor Justinian and his Attendants, ID Number 30-01-10/12, http://library.artstor.org/library).

The crossbow brooch appears to have disappeared from artwork for the remainder of the 6th century. However, there are still some 7th-century examples. The David Plates, for instance, can be dated to the first half of the 7th century (Lazaridou 2011, 162-163). This collection of silver plates displays scenes from the life of David, with the biblical figure of Saul present in two scenes: 'David before Saul' (Figure 126) and 'the Marriage of David' (Figure 109). In both scenes, a shape resembling the long foot of the crossbow brooch can be distinguished on his *chlamys* (Alexander 1977; Kitzinger 1977, 110; Weitzmann 1979, 478, 483; Leader 2000). The brooches have almost become unrecognisable, as is also the case with some (military) saint icons. Examples are the mosaics of St Demetrius (Figure 127) and the wooden Virgin and Child icon (Figure 128) (Kitzinger 1977, 105-106). This suggests that only the idea of the crossbow brooch remained.

Figure 109 Detail of the David Plate 'The Marriage of David'. The central figure is Saul, performing the ceremony, with something resembling a crossbow brooch on his chlamys (after Lazaridou 2011, 162).

After reviewing the art historical evidence in chronological order, we can distinguish several phases. These phases are more likely the result of the different art styles involved, often associated with movements away from or towards the more traditional styles. Developments in early Christian art and the transformation from Roman to Byzantine art play a major role here with regard to the choice of themes and figures. These phases also reflect the rather more dominant imperial reigns and reforms in Late Antiquity, such as the first Tetrarchy, the Constantinian dynasty and the reigns of Theodosius and Justinian. The gaps between these phases are not necessarily gaps in the biography of the crossbow brooch or periods without change on a social or historical level. We need information from other sources in order to see whether these gaps signify more than art historical intervals.

8.2.3 Historical references

As mentioned earlier, some caution is advised when referring to textual sources in the debate on crossbow brooches. This study found no texts with a direct indication or description of this type of brooch. Only four references to the word '*fibula(e)*' were found in contemporary sources (Table 20). The earliest of these occurs on the base of the statue

of Sennius Sollemnis –the 'marble of Thorigny' – and is dated to AD 219-220 (Figure 110) (Pflaum 1948; Vipard 2008). On one side, there is a copy of a letter to Sennius from the proprietor of Britannia, listing the proprietor's gifts to Sennius to mark his appointment to the post of tribune of the 6th Legion. Among many luxurious goods is a gold brooch with gems. Considering the early date and the mention of gems, it seems unlikely that this brooch was of the crossbow type. A second mention of a gold brooch is found in the *Codex Justinianus* (hereafter in reference CJ), in a section on the restrictions on the use of gems on precious dress items outside the imperial circle. The *fibulae* could only be valuable for their gold and artistic value (CJ 11.12.1). Another gold brooch is mentioned by Procopius of Caesarea (hereafter in reference PC) in his history of the Justinian wars. He recounts the story of a patrician who was stripped of his gold decorations by the Persian King Cabades after being defeated in battle (ca. AD 531) (PC, History of the Wars, 1.17.24-30)[21].

Figure 110 Le marbre de Thorigny: a complete representation of the monument before its destruction in June 1944 (Vipard 2008, 38; after Lambert 1833).

These references could include the crossbow brooch, but do not exclude other types of brooches either. The last reference to a brooch, also from the *Codex Justinianus*, does not specify the kind of brooch (CJ, *Digesta* 34.2.25.2). It is therefore not clear from the references whether crossbow brooches were considered a separate brooch type or an object that was only available to a restricted class.

[21] Translation by H.B. Dewing made available by the Project Gutenberg: http://www.gutenberg.org/files/16764/16764-h/16764-h.htm

Other textual evidence cited from past studies concerns references to the word *chlamys* (Table 20). It is used to refer to either a single cloak or an entire costume. The first often appears in a military context, as demonstrated by an example from both the *Codex Theodosianus* (hereafter in reference CT) and the *Codex Justinianus*, which states that one solidus should be given for each military cloak (CT 7.6.4; CJ 12.39.3. Another military reference can be found in CT 14.10.1). Ammianus Marcellinus (hereafter in reference AM) uses *chlamys* three times in anecdotes, hinting at a cloak that was part of imperial dress (AM 16.5.11; 16.13.13; 12.9.11). The second meaning is illustrated in a passage from the *Codex Theodosianus*, which stipulates that proper official dress should be worn at official events (CT 1.15.16). Procopius of Caesarea uses it in a similar manner when describing the effects of the plague in Byzantium. He states that no one could be seen wearing a *chlamys* in the streets because all men wore clothes fit for private use and remained at home (PC, History of the Wars, 2.13.19-4).

Although these texts contain a good deal of information on the restrictions or obligations of official and military dress and the correlation between these dress items and social identities, they cannot be used to comment directly on the use, significance or perception of the crossbow brooch as they contain no explicit mention or indication of this brooch type. Furthermore, very few crossbow brooches found in archaeological contexts are in fact made of solid gold, and this study has not encountered any use of gems, thus reducing still more the relevance of these texts.

Table 20 Antique references to brooches and clothing. References searched for mention of both *fibula(e)* and *chlamys*.

Source	Date (AD)	Part	Contents
Le marbre de Thorigny	219-220	Face 3	Letter from Claudius Paulinus (propraetor of Britannia) to Sennius Sollemnis (tribune of 6th legion)
Ammianus Marcellinus	350-380	XVI.5.11	About the virtues of caesar Julian
	350-380	XVI.13.13	About the behaviour of the courtiers in the camp of Constantius at Aquitania
	350-380	XXII.9.11	About Julian residing at court and speaking justice
Codex Theodosianus	438 *(401)*	I.15.16	Rules for *vicarii*
	438 *(396)*	VII.6.4	Rules about military clothing
	438 *(382)*	XIV.10.1	Rules for life inside the city walls
Corpus Juris Civilis: Codex	534	CJ.XI.12.1	Prohibitions on precious dress items
Justinianus	534	CJ.XII.39.3	Rules about military clothing
Corpus Juris Civilis: Digesta	534	DJ.XXXIV.2.23.2	Rules for exclusive jewellery and official dress
Justinianus	534	DJ.XXXIV.2.25.2	Rules for exclusive jewellery and official dress
Procopius of Caesarea	545-551 *(531)*	I.XVII.24-30	King Cabadas stripping gold ornaments from a patrician upon returning to Persia after defeat
	545-551 *(544)*	II.XXIII.19-4	The effect of the plague on Byzantium
Notitia Dignitatum	420	In partibus occidentis.IX	On official insignia for magistrates
	390	In partibus orientis.XI	On official insignia for magistrates

Table 21 Crossbow brooches with inscriptions and textual decoration.

Name	Text	Interpretation	Date (AD)	Provenance
Laci fibula	SEPTIMI VIV	Praise for Septimius (unappointed)	284-305	Laci, Albania
Arezzo brooch	HERCULI AUGUSTE // SEMPER VINCAS	Praise for a western emperor, most likely Maximianus (Herculius)	286-309	Arezzo, Italy
Taraneš fibula	IOVI AUG VINCAS // IOVI CAES VIVAS	Praise for an eastern augustus and caesar, possibly Diocletian and Galerius	293-305	Taraneš, Macedonia
'Diocletian' brooch	IOVI[O] AUG[USTO] // VOT[IS] XX	20th anniversary of Diocletian's reign, celebrated on November 20, 303	303	Erickstanebrae, Scotland
Untersiebenbrunn fibel	CONSTANTINE VIVAS	Celebrating Constantinius	293-305	Untersiebenbrunn, Austria

Turin brooch	CONSTANTINE CAES VINCAS // HERCULI CAES VINCAS	Celebrating Constantinius	306-307	Unknown
Caput Adriae fibula	MAXENTI VINCAS // ROMULE VICAS	Celebrating Maxentius and his son Romulus	308-309	Aquilea, Italy or Centur, Slovenia
Louvre fibule	D N CONSTANINI AUG // VOT X MULTIS XX	10th anniversary of Constantine's reign, celebrated on July 25, 315	315	Unknown
Niederemmel fibel	VOTIS X D N CONSTANTINI AUG // VOTIS X D N LICINI AUG	10th anniversary of Constantine's (July 25, 315) and Licinius's reign (November 11, 317)	315-317	Niederemmel, Germany
Julianus Brooch	IULIANE VIVAS	Praise for Julianus (unappointed, possibly Julian II)	*?335-350*	Unknown

8.2.4 Textual features on brooches

In contrast to historical texts, some direct textual evidence can be obtained from textual decoration present on brooches from the 3rd- to 4th-century transition. These decorations and inscriptions often praise specific emperors (*augustus* and *caesar*) or celebrate imperial events, thus allowing the attribution of accurate dates to these brooches (Table 21). For example, the 'Arezzo brooch' praises Maximianus and is therefore dated between AD 286 and 309 (Figure 111). Another example is the 'Taraneš brooch'. Its reference to both Diocletian and Galerius places it between AD 293 and 305 (Figure 112).The commemorations of specific events also provide us with very precise dates. Examples are the reference on the 'Diocletian brooch' to the 20th anniversary of Diocletian's reign (celebrated on 20 November, AD 303) (Figure 112), or the mention on the 'Louvre brooch' of Constantine's decennalia (held on 25 July, AD 315) (Figure 111) (more examples can be found in Deppert-Lippitz 2000, 46-51 and Van Buchem 1966, 67-69).

The brooches with imperial inscriptions appear to be confined to the first and second Tetrarchy, roughly between AD 280 and 320. Although these textual decorations make accurate dating possible, there is still a need for caution. A specific reference does not convey an exact production date, nor does it necessarily imply a presence in the immediate surroundings of the emperor mentioned. Instead, these kinds of decorated brooches should be understood as part of the imperial cult – possibly integrated into the commemorative elite gift-giving system such as the diptychs – and are more correctly used as a post quem indication.

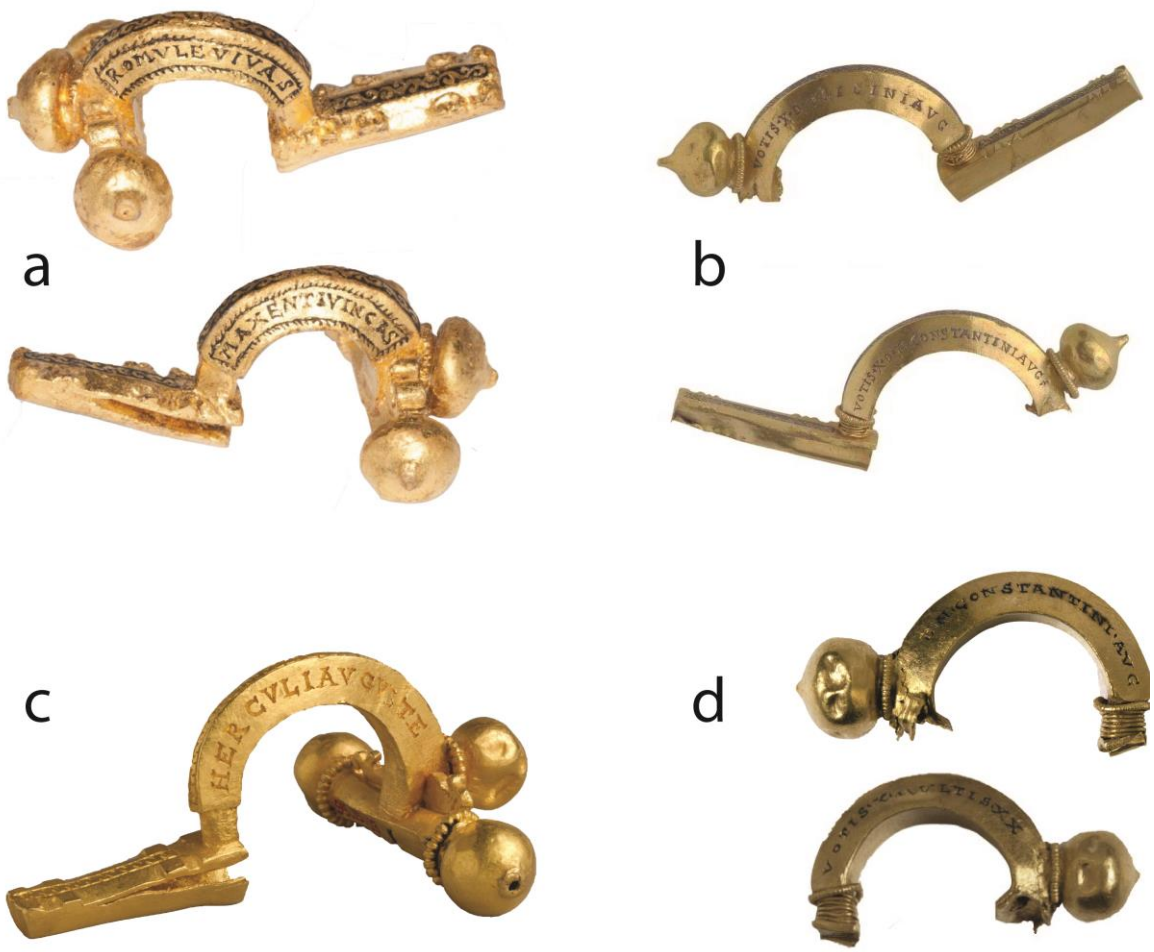


Figure 111 Compilation of brooches with inscriptions: a. Caput Adriae fibula; b. Louvre fibel; ca. Arezzo 'Maximian' crossbow brooch; d. Niederemmel fibel

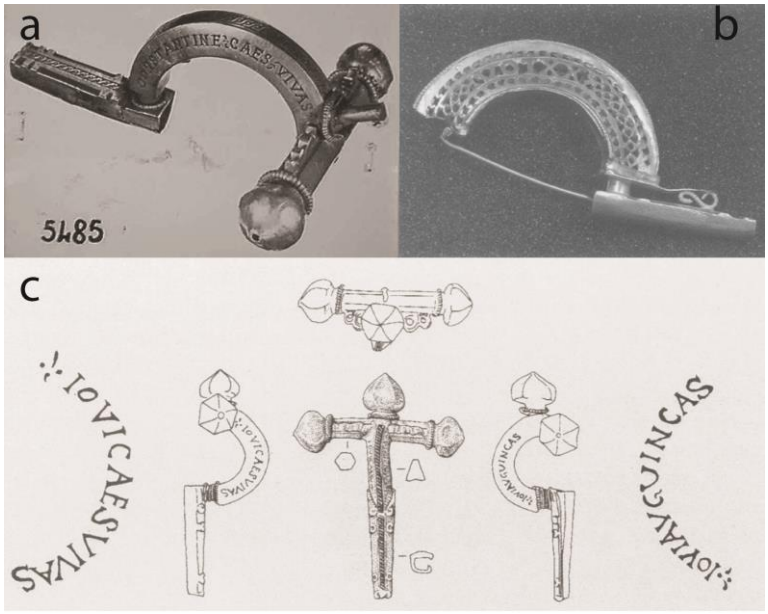


Figure 112 Compilation of brooches with inscriptions: a. Turin brooch; b. Erickstanebrae 'Diocletian' brooch; c. Taranes fibula.

8.2.5 Archaeological contexts from the Low Countries

In addition to the iconographic and textual evidence, archaeological contexts can also add valuable information to the socio-historical debate, despite a frequent lack of accurate dates. The assessment of archaeological contexts in this study is based on crossbow brooches from Late Roman sites in the Low Countries and is evaluated in chronological order to facilitate integration into the cultural biographical approach. Although this study focuses mainly on changes in context, it is also necessary to include the more significant changes in the general properties of the brooches themselves, which we will discuss more elaborated further on (see 8.3).

The total population of crossbow brooches (Belgium and the Netherlands combined) contains approximately 300 finds[22] and will hereafter be referred to as 'crossbow brooches from northern Gaul' (Figure 113). The collection of 'Low Countries crossbow brooches' is the selected sample from this total population (Figure 98). For some, we were unable to identify a type with certainty, so of the total amount of 185 for the Low Countries crossbow brooches, 179 remained available for this archaeological study (Table 22). Unfortunately, nearly half proved to be stray finds or older finds for which the nature of the context has been lost. Despite their limited use in a context-based study, these finds have helped to reinforce observations of the changes in brooch properties over time.

Table 22 Number of crossbow brooches per chronological phase for the different types of sites and general contexts of the Low Countries. This table presents the 179 brooches selected for this study. Above: brooches ordered by site type. Below: brooches ordered by context.

AD	**< 280**	**280-320**	**320-380**	**380-425**	***Total (n)***	***Total (%)***
Fort	9	4	30	6	*49*	*27,4%*
Urban	8	14	38	4	*64*	*35,8%*
Rural		1	2		*3*	*1,7%*
Unknown	5	15	40	3	*63*	*35,2%*
Burial	2	2	42	6	*52*	*29,1%*
Non-burial	15	7	15	2	*39*	*21,8%*
Unknown	5	25	53	5	*88*	*49,2%*

[22] Also included here is the inventory of Stijn Heeren.

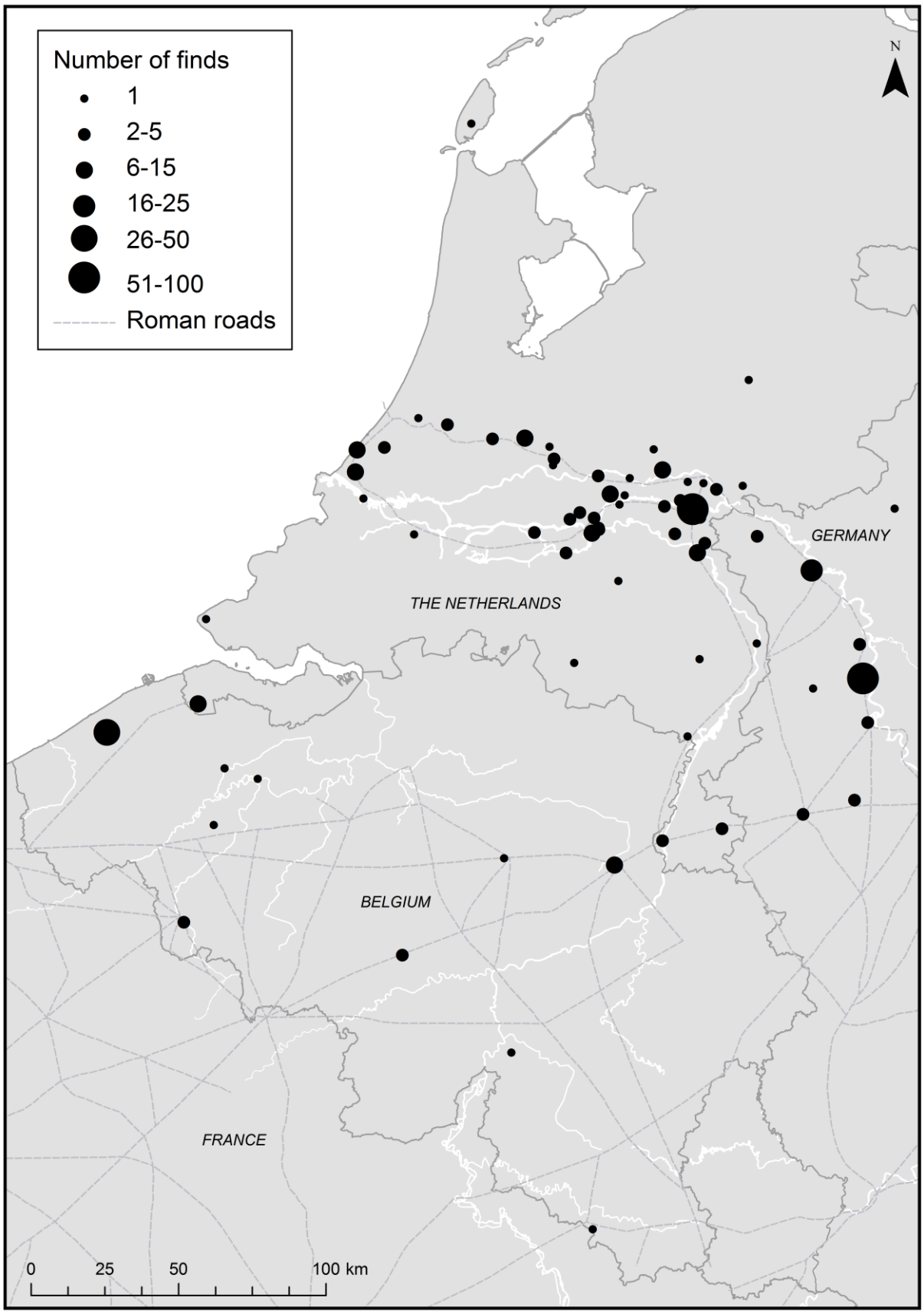


Figure 113 Sites and locations with crossbow brooches throughout the Low Countries and surrounding areas.

In view of the dating difficulties of the archaeological contexts, the emergence of the crossbow brooch can be placed in the 3rd century[23]. The finds from the earliest contexts show us on first observation that the initial form was little more than the general form of a bow brooch, similar to other types, with a hinge mechanism, which was not uncommon in the 3rd century (Van Buchem 1941, 120, plaat 118 fig. 121-129; Ettlinger 1973, 137-138; Riha 1979, 162-177; Feugère 1985, 18; Bayley and Butcher 2004, 179-185). The general shape of these earliest forms displayed little variation across different sites in the Low Countries and was sparsely decorated. The first noticeable change in the general properties of these brooches occurred in the transition from the 3rd to the 4th century, with the finds displaying an increasing variety in the form of the different components and decoration techniques. While the bulk of the composition remained a copper alloy, gold and silver coatings were encountered on multiple examples (detected by means of XRF analysis, see 8.4). This greater variation in brooch appearance indicates some freedom of choice in the manufacturing process. Nevertheless, their general shape continued to be very similar. Most likely, all brooches from this phase belonged to the same class of objects in the minds of observers.

The contexts in which these early crossbow brooches are found add little new information to our understanding of the emergence of this brooch type. The 3rd-century finds occur predominantly on military sites, as well as in smaller numbers on urbanised sites (Nijmegen and Tongeren), where a military presence can be expected (Figure 114). No fixed or specific depositional context pattern emerges from the archaeological record of the Low Countries. In general, only a scattered distribution can be observed, mainly in non-burial contexts (Figure 114), such as the excavation at the fort of Oudenburg. This excavation revealed a number of early crossbow brooches spread over a myriad of locations across the site, ranging from multiple pits to a construction layer for a well and a housing unit. This random distribution best corresponds to accidental loss, indicating that the brooches were worn while their wearers performed everyday tasks. These general observations correspond to evidence from comparable sites such as Augsburg

[23] The earliest finds from the Low Countries were mainly dated on a typological basis, for which parallels from other regions were used. This makes it difficult to pinpoint an exact start date for the crossbow brooch in the Low Countries. Since the first major changes in brooch properties can be traced to approximately AD 280, this moment was chosen as an *ante quem* date for the initial archaeological phase, until more precise evidence can be found.

(Pauli 2013, 403), Augst (Riha 1979, 51) and Richborough (Bayley and Butcher 2004, 106-115). The total distribution of the crossbow brooches of this earliest phase is less well known. The most recent distribution map can be found in the study of Pauli (2013, 408).

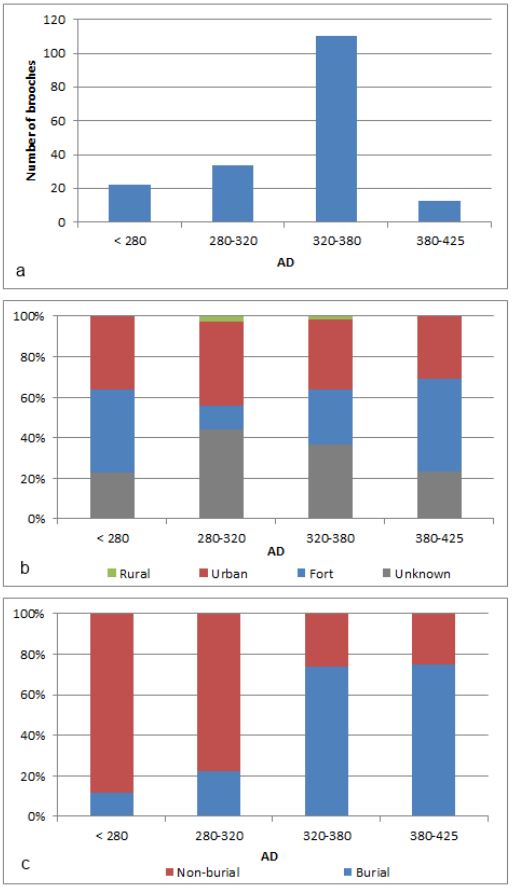


Figure 114 Number of crossbow brooches per chronological phase of the 179 brooches presented in this study. The date ranges correspond to the dates of the subtypes based on archaeological contexts; b. Percentage of brooches based on the different site types. The main function per site has been categorised as 'fort', 'urban' or 'rural'. The 'unknown' category contains stray finds and contexts without an identifiable site or structure; ca. Percentage of brooches based on the main character of the depositional context ('burial' or 'nonburial').

The increased variety in the 3rd- to 4th-century transition is related to a proliferation in the number of brooches in circulation (Figure 114). This is not merely a representation of the archaeological record, for the nature of the depositional context has not altered. The majority of finds are still encountered in non-burial contexts on sites with a military presence or association (Figure 115). However, this process changed over the course of the 4th century, when the introduction of inhumation and the role of the crossbow brooch as part of the burial costume caused the burials to become the main depositional context. This shift is noticeable at other sites as well, for example in Augst (Riha 1979, 51), where

the finds no longer appear to be randomly distributed across the site, but are clustered in the burials. The sharp rise in the number of finds in this period (Figure 115) also corresponds to the larger pattern from other provinces (Swift 2000, 31). Even though this picture is potentially influenced by post-depositional processes and greater care in the excavations of burials, the main difference between brooches from burial and non-burial contexts suggests an actual shift. By the end of the 4th century and the first decades of the 5th century, the number of finds from Late Roman Low Countries sites diminishes considerably (Figure 115). As a result, most brooches for this final phase originate from burials in Nijmegen, Tongeren and Oudenburg, i.e. the major military and administrative centres (Figure 115). The shift to burials as the intended depositional contexts for the crossbow brooch seems to have remained unaltered up to the end of the life of the crossbow brooch as an object type, although the small number of finds renders a definitive statement impossible.

Despite the increased use and number over the course of the 4th century, the object variations appear to decrease at the same time: less differentiation in component shapes was observed, as well as a reduction in the range of decoration to combinations of a fixed set of motifs. Additionally, no gold or silver coating was detected on any of the Low Countries brooches. This evidence indicates a reduced freedom of choice in the manufacturing process, suggesting the possible involvement of a control system or some measure of standardisation. At the end of the 4th century and the beginning of the 5th century, the final phase for the Low Countries, this apparent standardisation of the brooch shape disappeared once more as decoration techniques and motifs became excessive. And once again, multiple objects contained traces of gold in their coating.

The first half of the 5th century marks the end of the archaeological evidence for the crossbow brooch in the Low Countries, corresponding to the withdrawal of Roman military forces and the abandonment of the administrative centres in the region. The only exception is Childeric's brooch (Figure 124). Found in his burial site at Tournai, it is dated to AD 464-482 (Van Buchem 1966, 89-90; Deppert-Lippitz 2000, 59) and is therefore the only known crossbow brooch from the northern parts of former Gaul dating from the second half of the 5th century. It resembles the few others that have been found in and outside the borders of the later 5th-century Roman empire (Deppert-Lippitz 2000, 56-61). In general, the overall evidence for these late finds is poor and the context information usually unknown. Furthermore, the sharp drop in numbers appears to apply to the entire Empire. Although this archaeological study has focused on finds and contexts in the Low

Countries, no reliably dated finds or contexts for the 6th century were encountered for either the Western or Eastern Roman Empire.

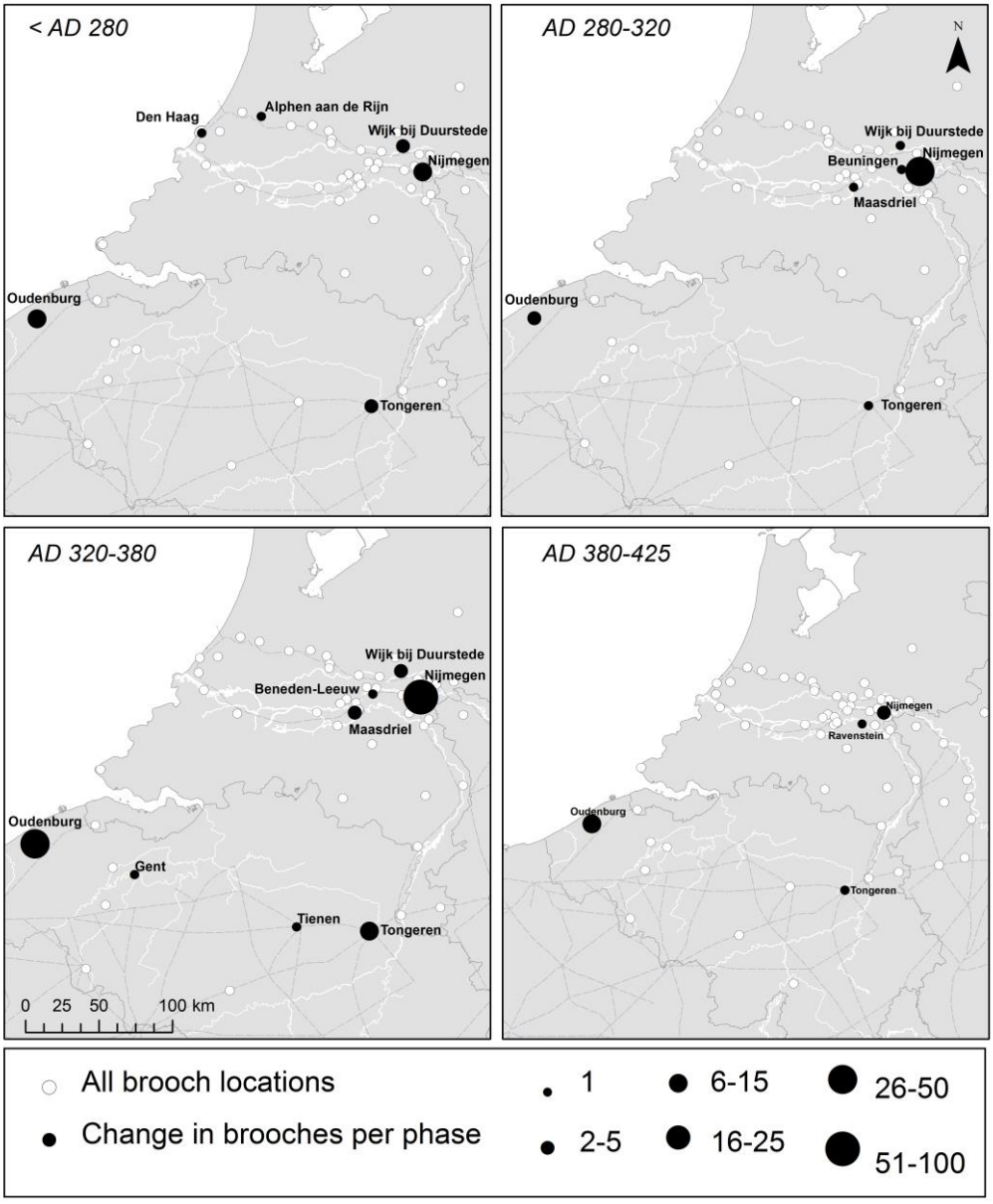


Figure 115 Changes in the number of crossbow brooches in the Low Countries per phase, based on the 179 brooches included in this study. The four phases correspond to the changes observed in the archaeological record and finds from the Low Countries.

8.2.6 Discussion on the social and historical context of the crossbow brooch

Proceeding towards a cultural biography of the crossbow brooch, we need to consider all the available evidence in its totality. The first question in an object biography is often the hardest to answer: how did this object come to be? There is little doubt that the origin of the crossbow brooch can be placed within the wider developments of the class of bow brooches during the 3rd century. However, it is a challenge to pinpoint an exact point in time or an event in society that triggered the start of the crossbow brooch as a distinct type with a clearly intended and recognised message, for there are no known depictions before the end of the 3rd century. A partial explanation lies in the dominant art style from the 3rd century. The longstanding tradition of Classicism portrayed figures mainly in a divine or heroic setting in the classic Graeco-Roman tradition, i.e. not dressed as contemporary people (Kitzinger 1977, 7-18). When military figures or people are depicted in a military scene in the late 2nd and earlier 3rd century, for example on the Arch of Septimius Severus (AD 203)(Figure 116), they appear to be wearing disc brooches rather than bow brooches. As can also be seen on the reliefs from the earlier column of Marcus Aurelius (AD 193) (Figure 117) and the Ludovisi Battle sarcophagus (AD 250-260) (Figure 118), depicting both Roman soldiers and Barbarian warriors. This suggests that disc brooches were the preferred choice for members of the military class until the early 3rd century. Early crossbow brooches were not only invisible in the art historical evidence, but there is also a lack of textual references (see above). Archaeological finds offer the most information about the initial developments, even though the evidence is scarce and the dating inaccurate. Reliable contexts containing these initial brooches can at best be placed between AD 250 and 280, although the brooches may have occurred earlier on. The existence of the early crossbow brooch can be confirmed with certainty in the second half of the 3rd century. Riha (1979, 167) argues a start near the end of the 2nd century although the recent study from Pauli (2013) and the evidence gathered from the Low Countries show primarily later contexts.

Figure 116 Detail of the Arch of Septimus Severius.

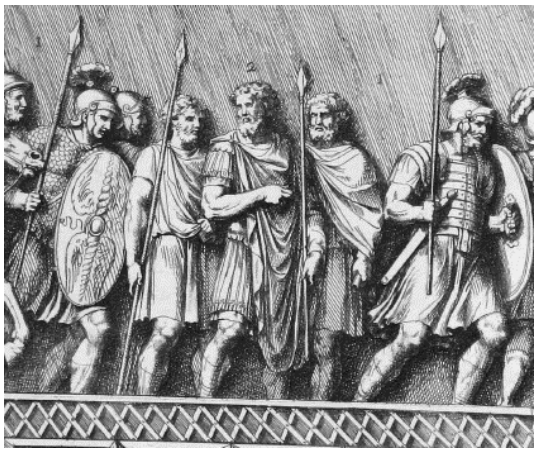


Figure 117 Detail of Column of Marcus Aurelius.

Figure 118 Scene from the Ludovisi Battle sarcophagus (AD 250-260).

This still leaves unanswered the question of the owners' identity. Because of their simplicity and uniformity, it can be argued that these 'simple' brooches belonged to common soldiers. However, if the brooches were available to multiple ranks of soldiers, we would expect a larger number of finds. The practice of recycling can partially account

for the possible lack of finds, as well as the absence of these brooches in burials. So should this phenomenon be understood as a transition to the hinge-based brooch, did they coexist, or were they intended for different ranks or social backgrounds? Without further reliable contextual data or new evidence from iconographic or textual sources, the brooch continues the risk of being associated with an unspecified type of military dress, although a more specific hypothesis will be proposed later on (see 8.3.3).

It is not until the 3rd- to 4th-century transition that interpretations can be based on more evidence. From an archaeological point of view, their everyday use and application remains almost as elusive as before. Despite the increase in the number of finds from the end of the 3rd century, the archaeological record fails to shed light on the circumstances surrounding when and for whom it was appropriate or permissible to wear this type of brooch. Additional information is found in the first illustrations of crossbow brooches. In this phase, most examples feature individuals wearing '*Pannonian* hats', such as the landowners of the Villa del Casala (Figure 102) and the figures on sarcophagi (Figure 104). It is no coincidence that these first illustrations correspond chronologically to the first Tetrarchy and the Constantinian dynasty. Together with the larger military and administrative reforms, the art styles and themes changed as well. The move away from traditional Classicism and the introduction of Christian art created an interesting pagan-Christian mix. The 4th-century sculptures on the Arch of Constantine illustrate this new style, although it can be seen in the well-known porphyry group of the Tetrarchs (Kitzinger 1977, 9, fig. 5). Despite the '*Pannonian* hats' on the Tetrarchs, no crossbow brooches are present on the sculpture. This confirms that the emperors themselves did not wear them at this time, nor is evidence found to support this claim for any later period.

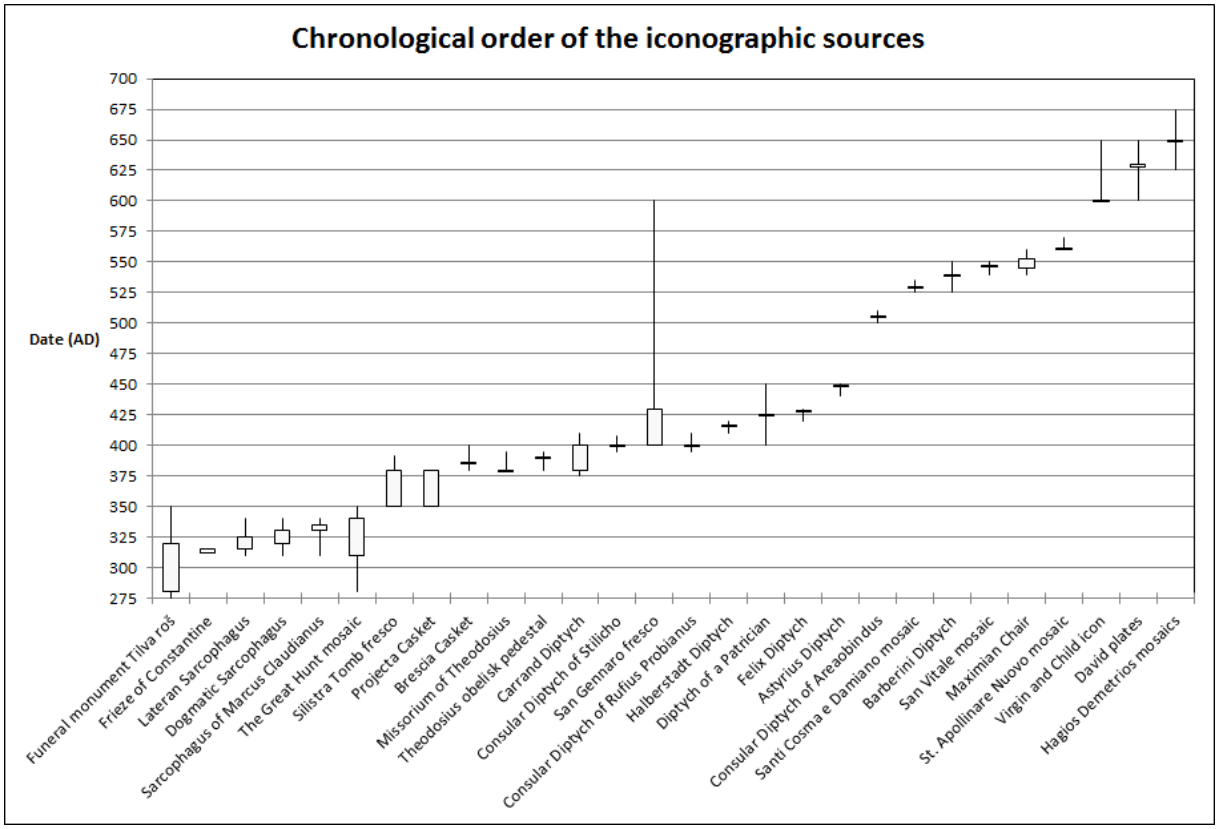


Figure 119 Chronological distribution of the iconographic sources used in this study. The boxes indicate the accepted or suggested date range of the source. The whiskers indicate the possible margins of the date range.

It was in this phase (ca. AD 280-320) that crossbow brooches with textual features made their appearance. Most inscriptions or textual decorations on the brooches praise the members of the Tetrarchies, often commemorating a specific celebration or event, such as the *decennalia*. This has to be seen in the context of the revival of the imperial cult after the turmoil of the 3rd century. These specific brooches could have been intended as gifts, possibly to be worn at the official event described in the text, or to commemorate an occasion coinciding with these events.

Although the art style remained undifferentiated throughout the first half of the 4th century, the archaeological evidence changed after ca. AD 315-320. A first observation is that textual features gradually disappeared from brooches lauding imperial events. A second and more significant change was the shift to burials as the depositional context. This can mainly be attributed to the growing practice of inhumation burials. This general shift from the world of the living to the world of the dead is striking. Although the brooches were still worn during a person's lifetime, it appears that the intended end of the brooch's life was its deposition in the grave, rather than being recycled or passed on to another owner. This suggests a close connection between the brooch and its owner, for

the burial goods were a reflection of the life of an individual and served as a display of social status in the burial rite. Moreover, the illustrations also occur most often on sarcophagi and in tombs. A final observation is that, despite a significant rise in the number of brooches at the end of this phase (Figure 115), there was no equivalent increase in the iconographical evidence.

If we combine all this information, we observe a distinct difference in the symbolic value between this phase and the initial developments earlier in the 3rd century. The social message conveyed by the brooches had become important enough to be depicted, suggesting that they carried a comprehensible message that was recognised by any spectator. Furthermore, this increased significance is reflected in their place in the burial dress and in the references on the brooches to the imperial cult.

Based on the iconographic sources, this message appears to be twofold. On the one hand, the brooches are worn by anonymous members of the military, as can be derived from their complete garb, including the brooch-hat combination. Examples include the figures on the Arch of Constantine reliefs (Figure 103) or the soldiers seizing Peter on sarcophagi (Figure 104). On the other hand, the brooches occur on more personal illustrations of individuals who were intended to be recognised, such as the villa owners on the mosaic of the Great Hunt (Figure 102), the master of the Silistra tomb (Figure 120) and possibly the two figures on the funeral monument from Tilva roš (Figure 162). This indicates that at that time (ca. AD 280 - 335/350) the brooches were most likely worn by individuals with a military and wealthy background, i.e. military officers. It is not yet clear if these individuals also had active administrative or political roles.

Figure 120 Detail of Silistra Tomb showing the master with the crossbow brooch, below the damaged section.

In the next phase, illustrations no longer occurred exclusively on monuments and tombs, but started to appear on portable objects as well (Figure 119). The earliest examples are the Projecta (Figure 163) and Brescia caskets (Figure 121), both adorned with images that contain Christian themes. In addition, the Missiorum of Theodosius (Figure 106) is in the same style as the caskets, despite the non-Christian nature of the theme. This style was not restricted to portable objects, as is evident from similarities to the reliefs of the obelisk pedestal in Constantinople. In general, there was a change in art style under Theodosius, sometimes referred to as the 'Theodosian Renaissance' (Kitzinger 1977, 38-44). The hierarchical order is decidedly present in this new style, although the figures portrayed still wear contemporary dress. Although many differences in the art historical evidence can be attributed to this new style, this appears to be confined to the choice of iconographic representation, rather than interfering with the general topics and themes. However, a possible significant change is the absence of '*Pannonian* hats' on individuals with crossbow brooches.

Figure 121 Lid of the Brescia Casket depicting the scene 'Jesus before Pilate'. The retinue of Pilate are all wearing crossbow brooches.

At the end of the 4th century and continuing into the 5th century, there appears to be a change in the identity of the figures portrayed with crossbow brooches. Observations show that the number of anonymous individuals fell in relation to the number of recognisable figures. This transformation is noticeable under the reign of Theodosius. The Brescia casket is possibly the last known example of completely unknown officials or officers being depicted alongside Pilate (Figure 121). Although the sources showing Theodosius himself still contain some anonymous officials, it can be argued that their identity may have been known to others, as they were probably connected with the

imperial entourage. The large increase in the number of recognisable individuals illustrated with crossbow brooches was mainly due to the emergence of consular diptychs (Figure 122). Although some individuals, including Stilicho for instance, had a clear military history, it appears that the primary focus was their official position as consuls. Much like the textual decoration on brooches during the Tetrarchy, the diptychs are closely associated with the imperial cult and the practice of commemorating events through gifts reflecting their official nature. Not only the diptychs, but also the tombs display recognisable figures. The Silistra tomb can be used to illustrate our point, as can the depiction of Theotecnus.

Figure 122 Detail of the Carrand diptych.

As well as shifts in art historical sources, we can observe changes in the archaeological evidence. A first observation is the considerable decline in the number of finds (Figure 115) despite their continued deposition in burials. A second observation relates to their limited distribution. By the end of the 4th century the brooches occurred only in the largest administrative and military centres of northern Gaul, probably due to the withdrawal of military forces from the region. This makes it impossible to derive a social association from the archaeological record. Moreover, by this time, military dress had clearly influenced the official civilian dress, which makes it very hard to distinguish a military or civilian identity based on burial goods or other contextual information.

While historical sources do not provide us with direct information on the crossbow brooch, they can improve our understanding of the social codes regarding the dress that incorporated this brooch type and the people who were permitted to wear it. The *Codex Theodosianus* is relevant for this phase. Although the work was not completed until AD 438, it was compiled from older laws and can inform us about the 4th to 5th century

transition. Two laws refer to the *chlamys* as a military cloak: one almost equates soldiers with their cloak (CT 7.6.4), while another mentions the rules governing a senator's military garb (CT 14.10.1). It seems that a senator was only allowed to wear military dress inside the city walls when chairing an official meeting or fulfilling his duties at a public trial. This implies a far-reaching amalgamation of military and official affairs in the higher ranks of the imperial government. A third section stresses the obligation for vicarii to wear their official dress at official events (such as seen on Probianus in Figure 123), using the word *chlamys* in the same manner as other references (CT 1.15.16). In addition to the codex, Ammianus Marcellinus also comments on this period, referring to the *chlamys* cloak on three occasions. Two passages refer to imperial dress, implying that the emperor also had a *chlamys* cloak (AM 16.13.13 and 22.9.11). Another passage recounts the improper behaviour of certain *agens*, who accepted gifts from the emperor (AM 16.5.11). None of these passages imply that the *chlamys* cloak was part of military garb. This indicates that by the end of the 4th century there was already a shift away from the close military association of earlier periods towards the more administrative and political circles.

Figure 123 Detail of the Probianus diptych (Deppert-Lippitz 2000).

This moment in the biography of the crossbow brooch demonstrates its advance in social rank. Figures shown wearing crossbow brooches were expected to be recognised, often by virtue of their political or administrative positions. The general iconographic trend and the use of the word *chlamys* in the codex and in Ammianus' writings imply that they were worn in wealthy and politically influential circles that were linked to the military establishment. The objects themselves had become more highly decorated and greater skill was required to create them. It seems likely that at this time the owners of crossbow brooches were consuls and members of the senatorial class itself.

It is difficult to assign a start and end date to this phase. Most changes that characterise the 5th century appear to have originated at the end of the 4th century during the reign of Theodosius (ca. AD 380). Due to the lack of art historical evidence between AD 335 and 380, determining the social position of crossbow-brooch owners immediately before this phase presents a challenge. Perhaps these developments had already occurred earlier in the 4th century. Pinpointing the end is equally challenging, as there is another gap in the art historical evidence starting from ca. AD 425-430 (Figure 119). Unfortunately, this also coincides with the end of the archaeological evidence from the Low Countries, making it difficult to ascertain whether this phase could be extended further into the 5th century. Only the Astyrius diptych (ca. AD 450) can be placed in this chronological gap. Until more evidence is available, this phase can be regarded as roughly corresponding to the Theodosian and Valentinian dynasties, ca. AD 380-430.

Apart from Childeric's grave, there is no more archaeological evidence available from the Low Countries from the second half of the 5th century. Moreover, archaeological contexts containing crossbow brooches are scarce across the Roman Empire. Many finds are old or stray finds, more often valued for their splendour than for their contextual information. Some of these brooches have been found beyond the recognised borders of the empire and could have belonged to local leaders with strong imperial ties, such as the Childeric brooch (ca. AD 464-482) (Figure 124) and the Apahida brooch (ca. AD 454-473). The latter supposedly belonged to a 'Germanic' leader called Omharus (Deppert-Lippitz 2000, 57).

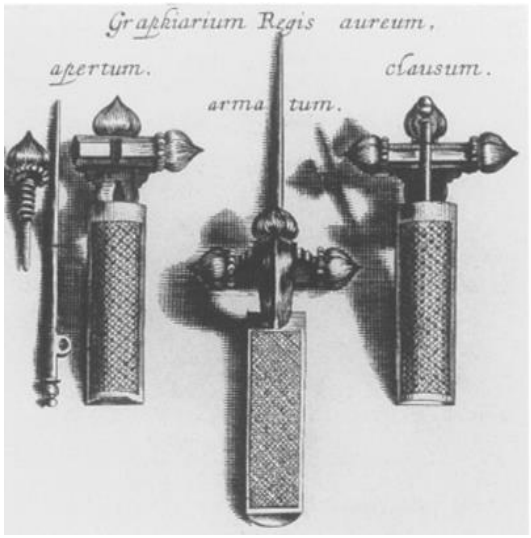


Figure 124 Childeric brooch

The art historical sources provide us with information again from the start of the 6th century. Some diptychs still contained illustrations of crossbow brooches, although more often than not they are absent. A new medium were church mosaics, depicting themes linked to the imperial sphere, such as the San Vitale and the St Apollinare Nuovo in Ravenna (Figure 108) and the Santi Cosma e Damiano in Rome (Figure 125). This resurgence of iconographic sources reflects Justinian policies and the emergence of Byzantine art styles.

Figure 125 Apse decoration from the Santi Cosma e Damiano (Rome) with St. Theodore on the right wearing a crossbow brooch.

More historical texts are available for this period, although still without direct reference to the crossbow brooch. In the *Codex Justinianus*, the *chlamys* is used in both military and official contexts. However, the most explicit military association is a direct copy from the *Codex Theodosianus* (CT 12.39.3). This suggests that the duality of meaning

was derived from recycling old law texts, rather than reflecting an actual dual significance.

In spite of little available evidence for over half a century, it appears that crossbow brooches became very exclusive objects during the Leonid and Justinian dynasties. The distribution of the archaeological and iconographical sources appears to be mainly confined to the Western political centres of Late Antiquity, such as Ravenna and Rome. The few examples found outside the official borders of the Roman Empire can be ascribed to 'Germanic' leaders, possibly connected to, or in service of, the emperor. By way of a general conclusion, they can be understood to represent a very elitist sphere, confirmed by their value in gold and the level of decoration. They may have been gifts from the emperor, or were only permissible for, or available to, the highest imperial ranks.

After another gap of half a century, the final illustrations of the crossbow brooch are found on portable Byzantine art from the 7th century, such as the David Plates (Figure 126) and certain votive icons (Figure 127, Figure 128). The brooch illustrations feature on popular Late Antique figures from Christian history, e.g. some military saints and the biblical figure of Saul. The brooches are hard to recognise – only the foot pointing upwards from the shoulder alerts us to their presence. In addition, there is no available archaeological or textual evidence. This suggests that crossbow brooches had ceased circulating, from which we can only conclude that they were no longer in use by this time. Perhaps they were still recognised as indicating important historical figures.

Figure 126 David Plate: 'David before Saul'

The disappearance of the crossbow brooch is unlikely to have been sudden. What is more plausible is that their exclusiveness from the later 5th century led to their gradual

disappearance. Although some continued to exist during the reign of Justinian in the first half of the 6th century, we lack properly dated archaeological finds to support this. It can be suggested that after Justinian's efforts to restore the former Roman Empire, crossbow brooches had already ceased to exist and their significance was only remembered through illustrations in works of art. The few 7th-century examples demonstrate that their appearance was no longer familiar, nor their proper context of use.

Figure 127 Votive Icon: St. Demetrius and donors (acquired from www.artstore.org).

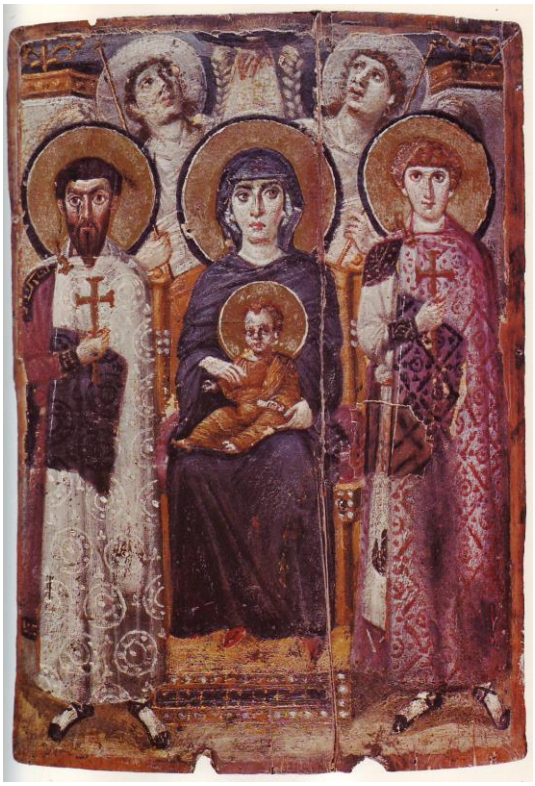


Figure 128 Votive icon: Virgin and child (acquired from www.artstore.org).

8.3 A regional object-based brooch study

In addition to the contextual evidence from archaeology as given in the cultural biography, it is necessary to make a detailed study of the stylistic changes present on the objects themselves. This part of the study uses the variation and change in shape, style and size to contribute to the debate on sociocultural significance and production of the crossbow brooch.

8.3.1 A method for stylistic evaluation

Despite the generally uniform look and its role as a social identifier, it is very rare for two crossbow brooches to be exactly the same (Swift 2000, 62). The various features are decorated with a myriad of styles, motifs and shapes which are driven by processes of uniformity and regionality, as well as expressions of identity and craft expertise. As a very visible dress element, a brooch was an ideal social indicator to convey a message to other

people, which often is expressed in the decorative nature of such an object (see Swift 2000, chapter 1 for a more detailed discussion on uniformity and regionality in dress accessories). Because of the many social processes involved in the production and consumption of crossbow brooches, and given its multidimensionality in which these could be expressed, it is not evident to classify a specific style as a local or regional trait or as the taste of a an individual (owner or craftsmen) or a social class. We cannot be certain as to what style conveyed what message, however, it is well known that the physical aspects of objects, such as the colour or the materials from which it was made, carried much meaning in communicating that message (Caple 2006). Therefore variation is key in the aspect of investigating stylistic traits, specifically the shapes and styles of the brooch. A distinction is made here between shape and style, although decorative shapes can also be seen as styles. A 'shape' is a general or separate feature that is essential to the make-up of the brooch, whereas a 'style' is a decorative motif applied on the shape.

We might not be able to reconstruct the original message, however, we can explore what changes could have been visible or perceived as significant. Nonetheless, univocally classifying the multitude of shapes and styles is not always clear or possible. Furthermore, defining the style is often more subjective than determining the shape, due to the lack of clear divisions between styles, of which some are clearly related to or evolved from each other. This can cause interregional stylistic comparison to become very difficult and complex. Moreover, combinations of style traits occur on a regular basis and make the distinction between styles more difficult. In short, the abundance of regional studies and multidimensionality of the crossbow brooch do not serve us as well as would be expected. Unfortunately, a complete exposition of the spatial distribution of each feature style and shape is beyond the scope of the questions in this study and would not deliver conclusive results, since only Nijmegen and Oudenburg contain enough crossbow brooches for a significant comparison in this (micro)region. An attempt to look for exhaustive regional traits and potentially identifying a workshop from stylistic traits, would need a larger spatial framework and reference set, which is again beyond the research intend of this study. Instead, the focus in this study remains on changes in style, context and production in order to explore the potential of these brooches to investigate changes in the Late Roman provincial society in northern Gaul.

A general overview of the most frequent stylistic trends will be given for the Low Countries crossbow brooches for the sampled population of 185 crossbow brooches from 12 sites from Belgium and the Netherlands (see 8.1, Figure 98). This will be done by

applying a profiling approach (see below) for the region of northern Gaul, first by reviewing the full range of variation in shapes and styles, followed by exploring the typological and chronological connection to the stylistic trends. Additionally, change in size will be considered as a contribution to the traditional stylistic evaluation of (crossbow) brooches. Finally, the physical changes in the Low Countries crossbow brooches will be investigated in their sociocultural context, established by the cultural biography.

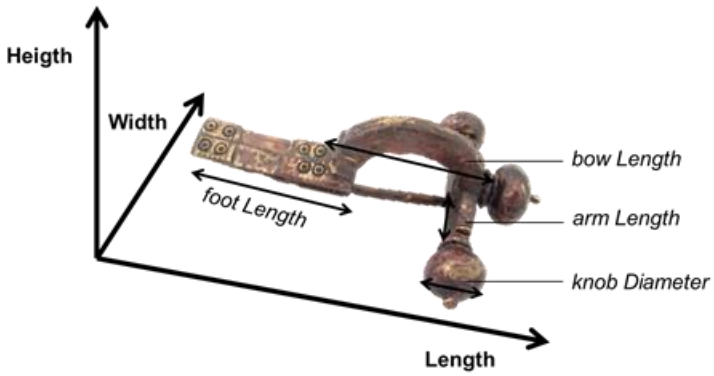


Figure 129 Crossbow brooch (type 3/4) from the 4th century military burial at Oudenburg, with indications of the terminology. Total dimensions include length, width and height. Separate features contain the arm length, bow length, foot length and maximal knob diameter.

8.3.1.1 Method: a 'profiling' approach

Previous regional studies have focused mainly on the foot decoration, or have selected some distinctive traits to appoint one or more brooches as originating from a specific region. The large interregional study of Swift (2000) resulted in some regional markers that can be used as a comparison, but did not discuss the entire range of variation for every region or brooch. Again, given the many variables and uniqueness of every brooch, this is very understandable. Rather than creating a closed classification of styles based on a few distinct variables, a 'profiling' approach is applied in this (micro)regional study of northern Gaul. This means a consideration of all variables, equally, on both the individual brooch and the typological level. For example:

(1) Individual description for a type 3/4 brooch

Foot: R – Exr – C = Rectangular (R) foot with extended rear (Exr) and cut trapeze (C) motif
Bow: R – C – Cn = Regular (R) bow with contracted (Cn) cuff (C)
Arms: Q – M = Quadrangular (Q) arms with mounted top (M)

Knobs: O – Bg = Onion shaped (O) with geometrically patterned base (Bg)

(2) Group description for the foot shape of type 3/4

No dominant foot shapes are present, common foot shapes include rectangular (R), widening (W) and tapered (T) and on rare occasions also a narrowing (Na) shape can occur.

This way, a nearly unique description is obtained for an individual brooch, as well as differentiating between what is a dominant, common or rare feature per type to accumulate a picture of what is normal for a brooch of a specific type in a certain region. The individual description acknowledges its unique aspects that are most likely related to the identity of the owner or characterising for the producer or workshop, and the group characterisation is more likely to be connected to the owners' expression of their social or group identity or representative for one or more workshops. The markers assigned to the shapes and styles here represent a variety of related styles and are accumulative in case of combinations or transitions. For example:

Foot: TR – Ino – CS = Tapered (T) Rectangular (R) foot with inclined orientation (Ino) and with cuts (C) and slopes (S) style

Additionally, to facilitate comparison the distinctions made are attempted to be an objective description of the form or motif and relate to the observations made in Swift's study (2000, chapter 2). A further distinction was made between the basic shape/style and shape/style additives: the former are the major decorative elements that determine and characterise its form and design, whereas the latter are motifs or extra features that are more common to be absent rather than present (Table 23 and 24).

Table 23 Variation of feature shapes with corresponding markers.

Foot and Bow Shape		**Foot Shape additives**	
S	Slim	Exr	Extended rear
R	Rectangular/Regular	Ino	Inclined orientation
W	Widening	Ebr	Elevated base and rear
Na	Narrowing		
T	Tapered		
Cuff Shape		**Bow Shape additive**	
R	Regular	C	Cuff
S	Small	Ir	Intermissive rear
Cn	Contracted	Ibr	Intermissive base and rear
P	Pronounced	Pb	Protruding base
Co	Coiled		
Ra	Raised		
Arm Shape		**Arm Shape additives**	
Q	Quadrangular	E	Elevated
P	Pentagonal	U	Undulating
H	Hexagonal	M	Mounted
Hp	Heptagonal	P	Protuberancing
O	Octagonal		
C	Cylindrical		
Knob Shape groups		**Knob Shape additives**	
El	Elongate	F	Faceted
E	Ellipse	Bg	Base with geometrical pattern
C	Cone	Db	Double base
O	Onion		

Table 24 Variation of feature styles with corresponding markers

Foot Style		**Foot and Bow Style additives**	
S	Slopes	G	Geometric
C	Cuts	V	Vegetation
Cd	Circle and Dot	D	Dots
F	Fan	Cy	Cyclone
I	Involuted		
Arm Style		**Cuff Style**	
P	Perforation	G	Geometric
Dp	Double perforation	L	Leaf
E	Eye		
De	Double eye		
X	No discernible style or shape / style additives		

8.3.1.2 Features and traits

First of all, the foot is the most prominent feature of the crossbow brooch, resulting in the central distinctive feature for subtypes in multiple typologies (Keller 1971, Swift 2000). Depictions also show the brooch worn with the foot aimed upwards, so the decorative style would be the most visible aspect of the brooch, together with the knobs. This feature of the brooch has both a functional and symbolic role: on the one hand it holds the needle in place to close the brooch and fastens the cloak and on the other hand it expresses a message to observers. The common shape is a rectangular (R) (seen from above and from the side) and most shapes are variation on this, such as growing more wide (W) or more narrow (N) towards the rear or tapered (T). Most frequent additives are a thin extension at the rear (EXR), an inclination in the orientation when the brooch is put on a flat surface (INO) or an elevation of the base and rear part (EBR) (Figure 130).

Because certain styles cross the borders between categories and some are clearly related or evolved from other styles, an attempt was made to deduct a stylistic evolution in the foot styles, considering their evident connection and transition. Due to the fast changing nature (archaeologically speaking) of style, however, this effort remains unsuccessful without more precise dating of either contexts or typology. As indicated above, the foot styles are the main decorative characteristics of the foot, whereas the

additives are motifs that run along the length of the foot in its centre and usually continue on the bow.

Secondly, the bow is the most functional attribute of the brooch. The space between the bow and the needle determines how much cloth can be held together by the brooch: a large arc means the potential to hold a thick fabric or multiple layers of cloth. In this case, it was designed to fasten a *chlamys* which was initially a military cloak (Parani 2007, 502-504). Due to the bow's mostly functional nature, it appears at first to have less variation in shape and style, however, it holds subtle differences in shape and often has a style addition that continues from the foot running along its length. To the observer, the bow and foot would have been seen as a straight uninterrupted line. Besides the distinction in shape, which are the same as for the foot, the bow lacks main decorative features that alter its form and lay out, as is normal for the foot. As a result, the bow only has style additives, which are again the same as for the foot. However, the bow does have shape additives, such as a break in the rounded arc, described here as an intermissive base and/or rear (IB/R). Additionally a protruding base (PB) can occur, which resembles a slight undulating curve at the beginning of the bow. Finally, the most common additional attributes on the transition of the bow to the foot is known as a cuff (C). The cuff has a wide variety of shapes, including a small cuff (S), a negative or contracted cuff (CN), a coil around the negative cuff (CO), a pronounced and mostly elaborate shape (P) and a cuff in an upwards orientation relative to the base (RA). (Figure 131) The cuff style corresponds mainly with its shape, although in rare cases additional motifs are found on them. However, the style and motifs are both either in a geometric shape or pattern or are leaf shaped or decorated with a vegetational motif.

Thirdly, the arms contain the bar (hence the alternative 'crossbar') for the hinge mechanism of the brooch. Save from most earliest 3rd century examples (type 0), two knobs or terminals are attached at each arm (arm knobs) and the area that connects the bow with the arms contains the third knob (bow knob). The basic shape of the arms is quite simple and ranges from a cylindrical to an angular shape. The number of angels varies from 4 to 8 and are given corresponding names: quadrangular (Q), pentagonal (P), hexagonal (H), heptagonal (HP) and octagonal (O). Shape additives are very common on top of the arms, adjacent to the base of the bow. Again, they appear to be variations on the same idea and are difficult to distinguish. A division has been made here between an elevated, an undulating, a mounted and a protuberancing top. The main style associated with the arms are symmetrical single or double circular motifs on both arms. A distinction

has been made between a perforation (P), which perforates the arm or added top, and an eye (E), which is superficial (Figure 132).

Finally, the knobs are what made this type of brooch very distinctive from the other bow brooches in the 3rd and 4th century, as well as in the archaeological record. The brooch type in German is named after the onion shaped knobs (*Zwiebelknopffibeln)*, and the generic Dutch name derives from the three knobs (*Drieknoppen*fibula*)*. The explicit knobs are only consistently present from type 1 onward, which explains also the lack of the direct predecessor in many typological studies. And although the bow knob is present in type 0, it has an elongated shape at first, very different from the later knob shapes. Due to the very large variety in shape and the difficulty to exactly match a shape with a corresponding correct descriptive name, it was chosen here to work with knob groups. The elongated group (EL) contains flat, cylindrical and semi-cylindrical elongated bow knobs; the ellipse group (E) holds all shapes resembling an egg, mushroom, sphere or pear; the cone group (C) exists of cone, pinecone and faceted shapes; and the onion group (O) includes the shapes similar to an onion, an apple and a tagine. The shape additives for the knobs are the features at the end of the arms and at the base of the knobs. Mostly the consist of a circular base with a geometrical pattern (BG), a faceted base (F) instead of a smooth circular and in a few cases a double base (Figure 131).

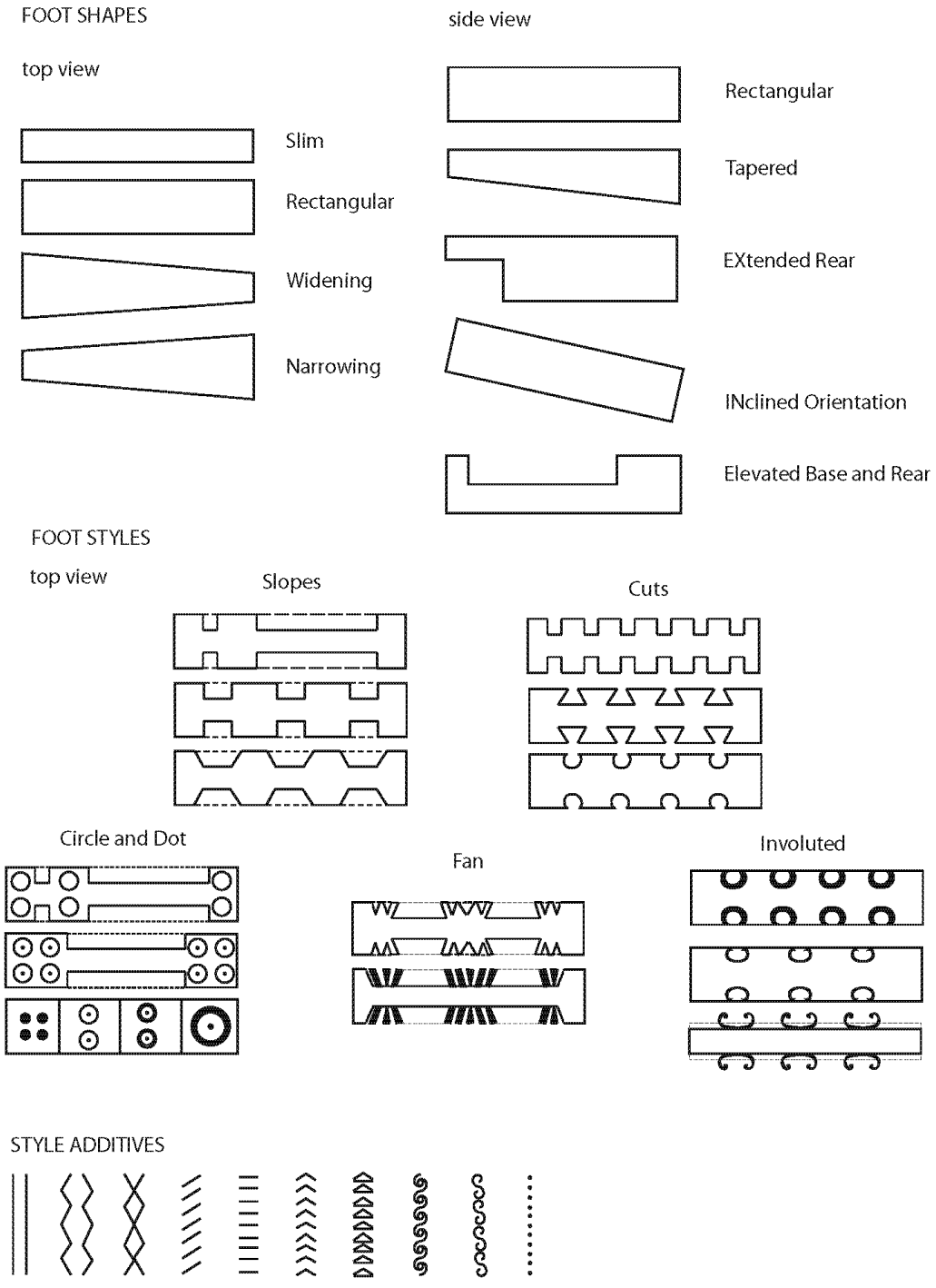


Figure 130 Representation of variation for the foot shapes, foot shape additives, foot style and foot and bow style additives present in the Low Countries crossbow brooches.

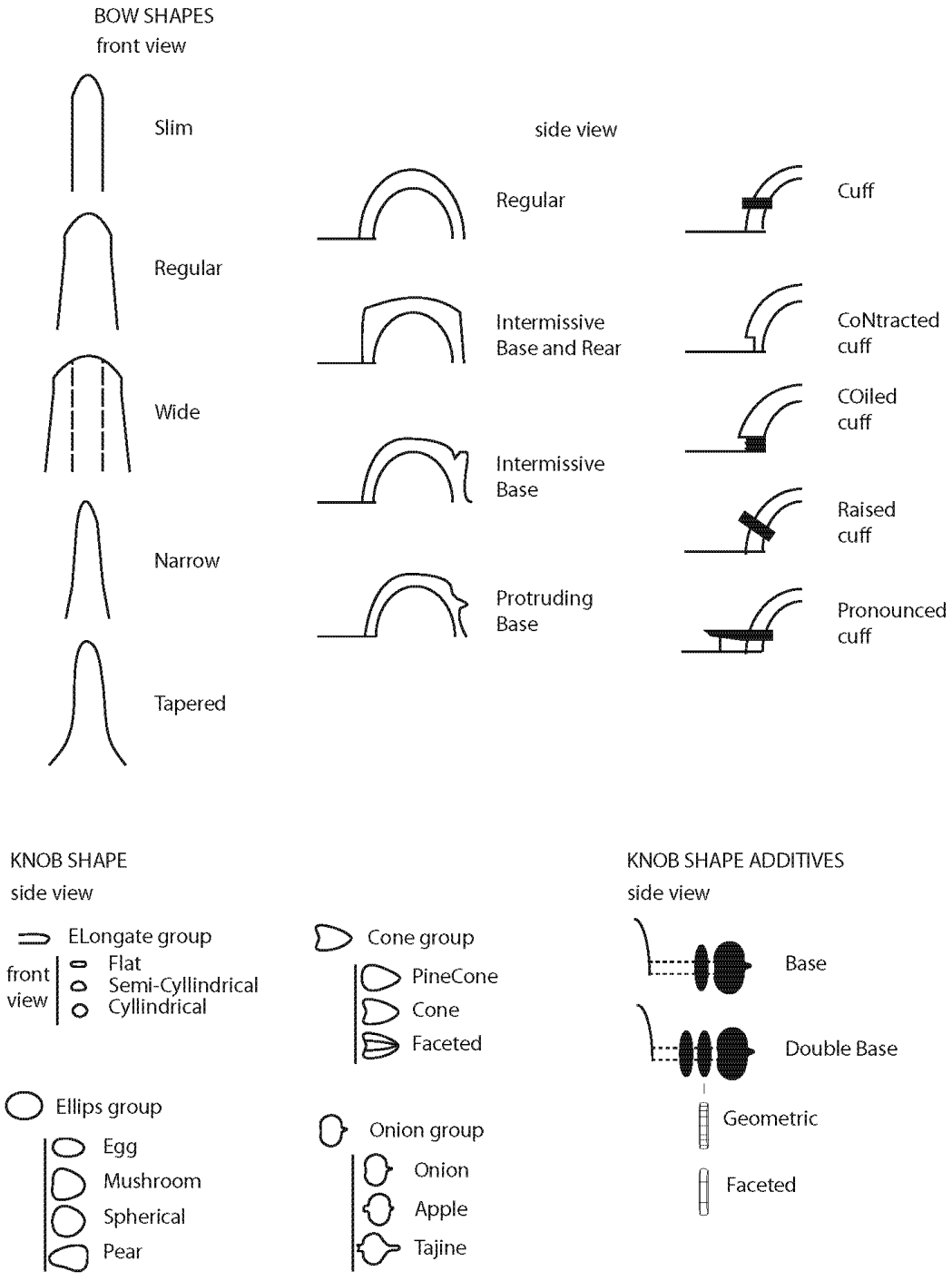


Figure 131 Representation of variation for the bow shapes, bow shape additives, cuff shape, knob shape groups and knob shape additives present in the Low Countries crossbow brooches.

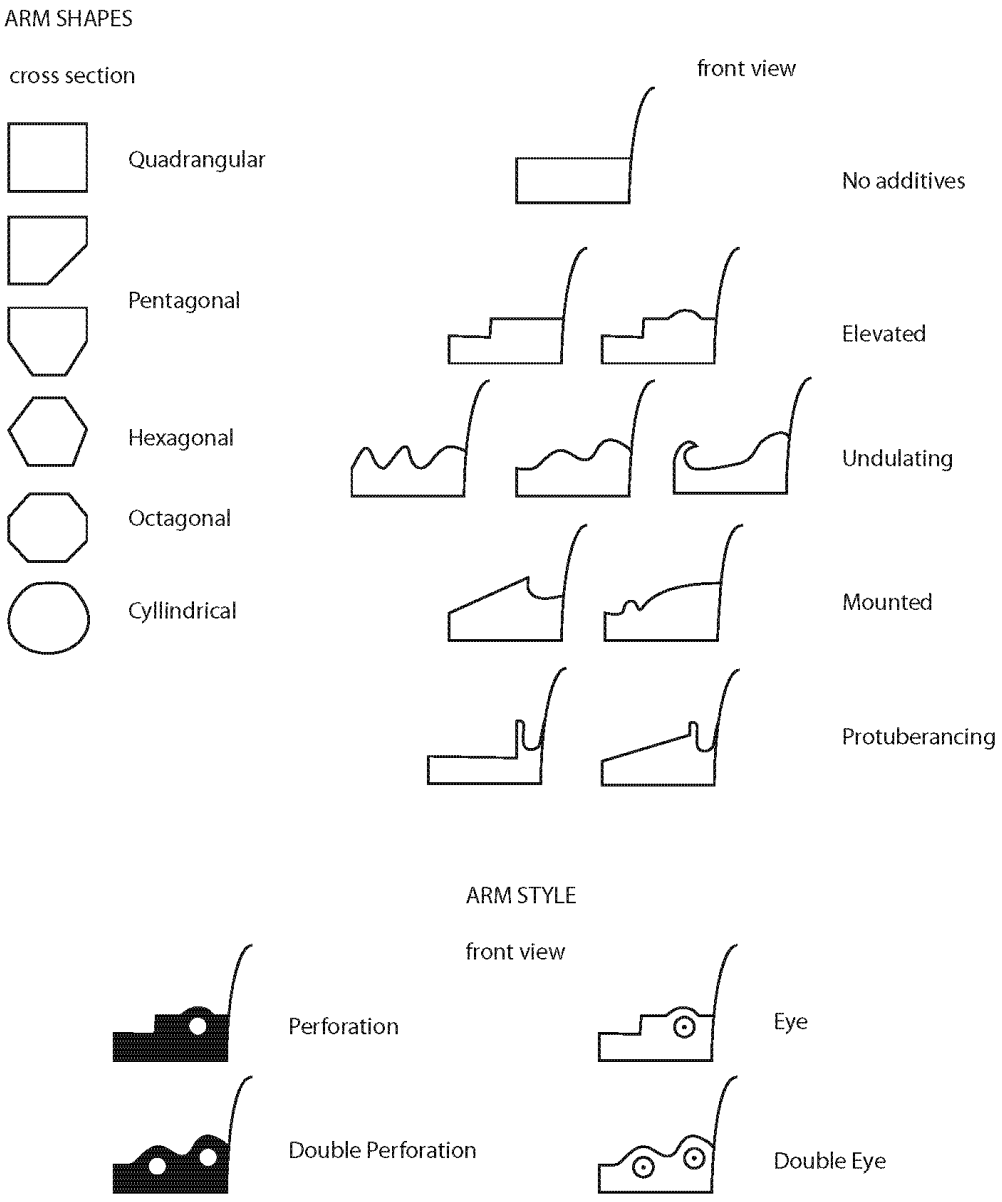


Figure 132 Representation of variation for the arm shapes, arm shape additives and arm style present in the Low Countries crossbow brooches.

8.3.2 Shapes, styles and typology

8.3.2.1 Profiling crossbow brooch types from northern Gaul

Briefly, a concise overview of the dominant, common and rare properties and features will be given per type, in order to form an image of what crossbow brooch types looked like in northern Gaul. In Figure 139, the dominant properties (green) are the major shapes or styles occurring with 40% or more in the population of the studied brooches. Common (blue) are those that occur within 10% to 40% and 10% or less are considered rare attributes (red).

The brooches of type 0 (Figure 133) dominantly consist of a slim foot with elevated base and/or rear with a slope style and no further added motifs; a slim bow without cuff; cylindrical or hexagonal arms without shape or style additions; and an elongated bow knob and no arm knobs. Commonly found are a cut style or a lack of style on the foot, however a dotted motif can occur for both the foot and the bow. Additionally the bow can have a tapered shape with either an intermissive base and rear or a protruding base, also a raised leaf cuff is often found. The arms can also be pentagonal and end in ellipse shaped arm knobs. On rare occasions a narrowing foot can occur, as well as a rectangular or narrowing bow with only an intermissive rear and an added geometrical motif. Other rare features are small cuffs, quadrangular arm shapes, a protuberancing top on the arm, ellipse or cone shaped bow knobs and an added double base.

Figure 133 Type 0 example.

Type 1 brooches (Figure 134) lack a dominating shape in both foot and bow by showing an almost equal spread between the variations. The arms are mainly hexagonal without additions and both the arm and bow knobs vary between cone and ellipse shapes, with a preference for cone like knobs. The only dominant style are the cuts and slopes on the foot. The range of common shapes includes slim, tapered, narrowing and rectangular for the foot; tapered, regular and narrowing for the bow and pentagonal for the arms. Other common features are an inclined orientation of the foot, regular to small cuffs, added

geometrical motifs on the bow and a double base near the knobs. Rare features include: a widening foot, an extended rear, a geometrical motif on the foot, a vegetational motif on the bow, contracted or geometrical and leaf shaped cuffs, heptagonal or octagonal arms with added tops varying between a mounted, undulating, protuberancing and elevated shape, with on rare occasions an additional eye motif.

Figure 134 Type 1 example.

Many shape and style variations characterise the type 2 crossbow brooches (Figure 135). The frequency of foot and bow shapes are still spread across the many variations, although the tapered foot has become more dominant and the presence of a cuff has become the norm. The arms are mainly hexagonal with undulating tops, without added motifs; and the knobs are predominantly of the cone group. The large variation expresses itself in the common features. For the foot these entail a narrowing, rectangular or widening shape with an extended rear and different cuts, slopes and circle and dot styles, with occasionally an added geometrical motif. The common bow shapes differ between tapered, widening and narrowing, although regular seems the most frequent. These are decorated with either geometrical or vegetational motifs and combined with a regular, contracted, small or pronounced, often leaf-styled, cuff. Additionally, pentagonal and quadrangular arms and undulating tops occur, as well as single or double perforations and an eye motif. In increasing frequency, ellipse and onion knobs can be found, as well as bases with geometrical patterns. A large quantity of less frequent features include: a slim shaped foot and inclined orientation; involuted, fan or no style on the top of the foot; dotted, vegetational and cyclonic motifs on foot and bow;

coiled and geometric-styled cuffs; octagonal arms and elevated tops; and double and faceted bases on the knobs.

Figure 135 Type 2 example

Type 3/4 brooches (Figure 136) are known for their uniformity, despite their quantity and distribution, however, a detailed observation reveals much variation. No dominant foot or bow shapes emerge, although an extended rear and a circle and dot style have become the dominant look, as well as the regular cuff. The arms are predominantly quadrangular with undulating top, and the knobs are mostly onion shaped with geometrical patterned bases. Beside these typical features, a whole range of common elements can be found: the foot can be tapered, widening or rectangular and can have an inclined orientation, as well as cuts and slopes styles and geometrical motifs; the most frequent bow forms are regular and widening, but tapered and narrowing occur also on a regular basis, with a contracted or small cuff and often in geometrical style. Additionally, hexagonal arms occur and can be accompanied by mounted or elevated tops and a perforation or eye motif. Ellipse shaped knobs occur in much smaller quantities than the onion-shaped examples. Rare features are again extensive and encompass: a narrowing foot shape; involuted, fan or no foot style; coiled or leaf-styled cuffs, cyclonic or vegetational motifs on the bow; pentagonal arms; double perforation and double eye motifs; cone shaped knobs and double bases.

Figure 136 Type 3/4 example.

The final two types are rather underrepresented, due to their more exclusive nature(see 8.2). Although the displayed lack in variation will be partially biased by this, the decorative nature and presence or absence of certain elements are still valuable to consider in the biography. Type 5 brooches (Figure 137) have mostly a rectangular foot with a cut style, a widening bow with cuff, hexagonal arms with an undulating top and onion shaped knobs. Also commonly occur: a tapered foot, an inclined orientation, the presence of a slope style or the absence of a style on the foot, additional geometrical and cyclonic motifs on the foot and bow, small and regular cuffs, mounted tops and single or double perforation on the arms and cone shaped knobs.

Figure 137 Type 5 example

Brooches of type 6 (Figure 138) most frequently contain a narrowing foot with inclined orientation and an involuted style, a widening bow with coiled cuff, hexagonal arms with an undulating top and a double perforation and cone shaped knobs. Less frequent, but commonly occurring are: a widening, tapered or rectangular foot; circle and dot style; cyclonic motifs on foot and bow; a tapered bow; regular and contracted cuffs; quadrangular arms; mounted tops; double eye motif; onion and ellipse shaped knobs and geometrically patterned bases.

Figure 138 Type 6 example.

	0	1	2	3/4	5	6
FOOT SHAPE	S Na	S T Na R W	T Na R W S	T W R Na	R T	Na W T R
FOOT STYLE	S X C	S C X	S C Cd I F X	Cd C S I F X	C S X	I Cd
BOW SHAPE	S T R Na	T R Na	R T W Na	R W T Na	W	W T
CUFF SHAPE	Ra S	Ra S Cn	Ra Cn P S Co	Ra Cn S Co	S Ra	Co Ra Cn
ARM SHAPE	C H P Q	H P O Hp	H P Q O	Q H P	H	H Q
ARMKNOB SHAPE	E	C E	C E O	O E C	O C	C O E
BOWKNOB SHAPE	Elo E C	C E	C O E	O E C	O C	C O E

	0	1	2	3/4	5	6
FOOT SHAPE ADDITIVES	Ebr	Ino Exr	Exr Ino	Exr Ino	Ino	Ino
FOOT STYLE ADDITIVES	X D	X G	X G D V	X G Cy	X G Cy	X Cy
BOW STYLE ADDITIVES	X D G	X G V	X G V D Cy	X G Cy V	X G Cy	X Cy
BOW SHAPE ADDITIVES	C Ibr Pb Ir	C	C	C	C	C
CUFF STYLE ADDITIVES	X L	X G L	X L G	X G L	X	X
ARM SHAPE ADDITIVES	P	M U P E	U M E	U M E	U M	U M
ARM STYLE ADDITIVES	X	X E	X P E Dp	X P E Dp De	X P Dp	Dp X De
KNOB SHAPE ADDITIVES	Db	Db	Bg Db F	Bg Db		Bg

Figure 139 Typological profiling scheme for the changing dominant (green), common (blue) and rare (red) shapes and styles present in the Low Countries crossbow brooches.

8.3.2.2 Shape and style trends

In this section a brief overview of the most significant trends in the evolution of each part of the crossbow brooch through the different types will be given. Since the crossbow

brooch typology is not a linear successive model (see 8.1), the typological trends will be reviewed per feature to facilitate the integration of the major stylistic changes over time.

The foot

The most highly decorated and varying element of the crossbow brooch is the foot. Many variables are necessary to describe every stylistic aspect of its changing shape and style throughout the life of the crossbow brooch (Figure 140 and Figure 141). The original foot shape is a slim foot, which declines in types 1 and 2 when new shapes are introduced and ceases to occur after that. The rectangular foot is always present from type 1 onwards in slightly growing quantities and becomes the dominant shape of foot in type 5, but does not remain so in type 6. The narrowing foot occurs in all types, except for type 5, with a low percentage in types 0, 1 and 3/4 and a more visible presence in types 2 and 6. The widening foot shares a similar pattern and is most frequently found in type 3/4. The tapered foot is always a common feature from its introduction in type 1 and is the norm in types 2 and 3/4. The tapered element is in combination with the rectangular, narrowing or widening foot shape. The overall spectre of variation shows that types 2, 3/4 and 6 are very similar with a fairly equal distribution of shapes. Types 0 and 5 are dominated by a single shape. For type 0 this can be attributed to the limited decoration compared to the later types and its cast production. Type 5 can be biased by the low number of examples. Type 1 and 2 exhibit all shapes, both the original slim foot and the new introductions, indicating a transition or a growing phase.

The foot shape additives are mainly absent and have a limited variation. The extended rear and inclined orientation are the only two continuous features. The extended rear is introduced in type 1 and occurs in growing frequency until type 3/4. The inclined orientation is more common and occurs in combination with the extended rear, although it is the more dominant feature in type 1 and is the sole additive in types 5 and 6. The elevated base and rear is exclusive for type 0 and does not seem to occur in any of the later types at all. Other additives such as a wide base (WB), an elevated rear without an elevated base (ER) and the combination of an elevated rear with an inclined orientation (EI) were observed as well, but were limited to only one or two examples. Only types 0, 3/4 and 6 exhibit additives in approximately 50% of the examples, followed by type 1 with a 40% presence and types 2 and 5 show no more than 20% additives.

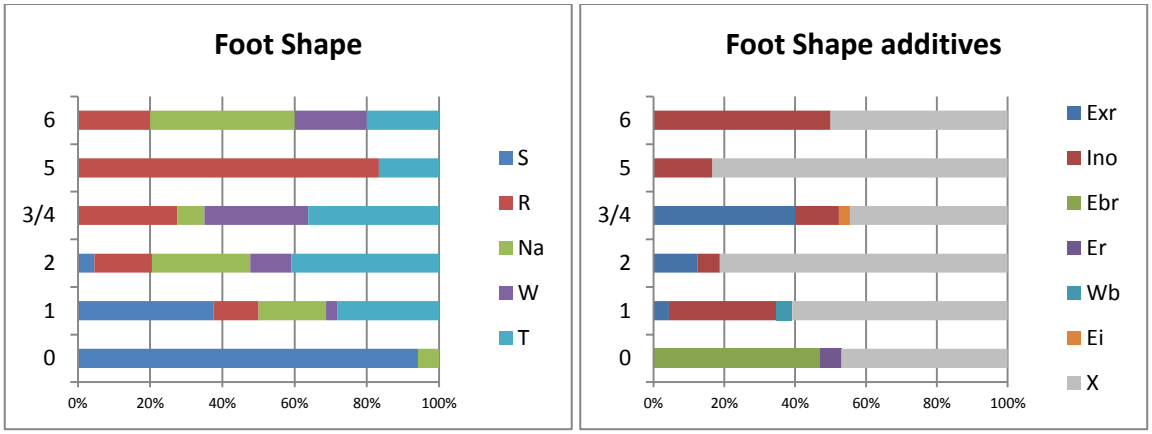


Figure 140 Variation in foot shape (left) and foot shape additives (right) sorted per type. Total amount of samples for the foot shape: 0 = 17; 1 = 32; 2 = 44; 3/4 = 80; 5 = 6; 6 = 5. Total amount of samples for the foot shape additives: 0 = 17; 1 = 23; 2 = 32; 3/4 = 65; 5 = 6; 6 =4.

The foot style or foot decoration is the most studied decorative feature of the crossbow brooch, many different types of styles have been documented and categorised. Due to the high level of uniqueness in every foot decoration encountered in the Low Countries brooches, preference is given to study the trends in style groups (as explained above).The most recurring styles are the cuts and slopes, which are also often found in combination. They occur in the same types (all except 6) with changing dominance, but together always as the most frequent styles, except for type 3/4. Here the circle and dot style is the most frequent, which originated in type 2 and only reappears in type 6. The involuted and fan styles originate in type 2 as well, but are represented in rather limited quantities in type 3/4. The fan style does not become very successful and ceases after that, opposed to the involuted style that grows into the dominant style in type 6. The absence of a foot decoration is rare and is mainly restricted to brooches of type 0. Again, the 'large' quantity of absent decorations in type 5 has to be understood as biased by the few examples. Additionally, it is possible that additional niello inlaid decoration has not been preserved on the brooch (characterising for subtype 5i, see Swift 2000, 70-72), only giving the impression that no decorative style was present.

The additional motifs are mostly absent. Especially in type 0 and 1 they are rarely present, although they become more common in the later types, approximately on 1 out of 3 examples. The most popular motif is the geometrical, however, it does not appear on types 0 and 6. In type 0 the dots are the only additional style and type 6 exhibits only added cyclonic motifs. This decorative element originated in type 3/4 and became increasingly popular in types 5 and 6. The vegetational motif is only found on type 2 brooches.

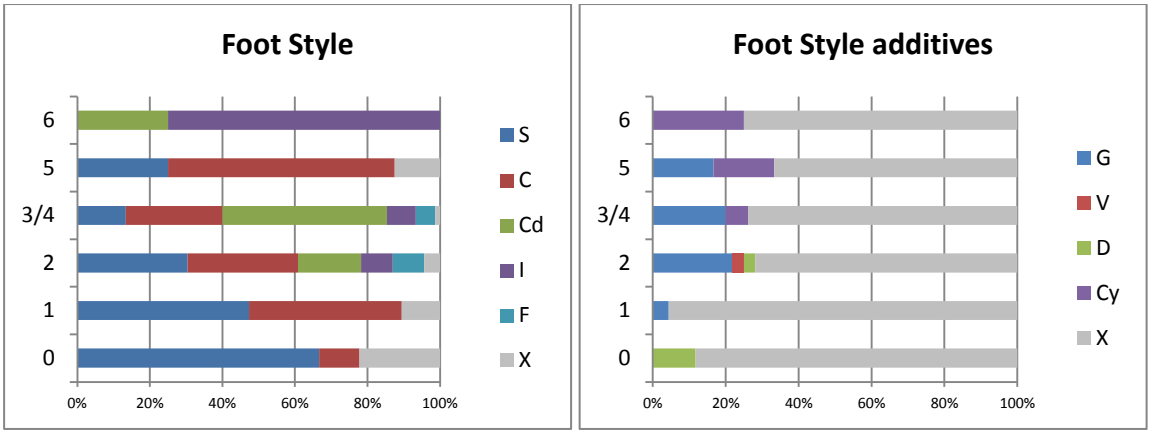


Figure 141 Variation in foot style (left) and foot style additives (right) sorted per type. Total amount of samples for the foot style: 0 = 18; 1 = 38; 2 = 46; 3/4 = 75; 5 = 8; 6 = 4. Total amount of samples for thefoot style additives: 0 = 17; 1 = 23; 2 = 32; 3/4 = 65; 5 = 6; 6 = 4.

To make sense of the significance of all these variables, we have to consider the most important trends and look at the degree of variation or lack thereof in each type in order to understand change or stasis beyond mere typological comparison. The largest variation in the foot is expressed in types 2 and 3/4, although most new styles and shapes are introduced in types 1 and 2, while maintain certain 'original' elements from type 0, such as the slim foot (S). Many of the features present in types 1 and 2 are present in types 3/4, 5 and 6 as well, however, they display the tendency to fluctuate and generally the variation diminishes in types 5 and 6.

The bow

The bow is mainly less divers than the foot, although the additional elements can cause very distinct designs (Figure 142 and Figure 143). The original bow type is also a slim bow, but does not appear in any of the later types. The regular bow is the most common originating from the type 0 until type 3/4. The narrowing bow displays a similar trend, however, it decreases after its peak in type 1. Both features do not occur in the type 5 and 6 brooches, which are characterised by the widening shape, that became more frequent from type 2 onwards. Similar to the foot shape, the tapered bow is present in all types, except 5. Many similarities between the foot and the bow can be drawn, such as the main absence of added styles. Only type 2 and 3/4 brooches display an additional motif in half of the cases. The geometric motif is the most common and is present in all types but 6, with a peak for type 3/4. The dotted line only appears in types 0 and 2 and the vegetational motif is slightly more present than on the foot. Not only on type 2, where it has its peak, but it is encountered on a few examples from types 1 and 3/4 as well. The

cyclonic pattern finds its origin in type 2, rather than type 3/4 and grows consequently to the sole added style on the bow in type 6.

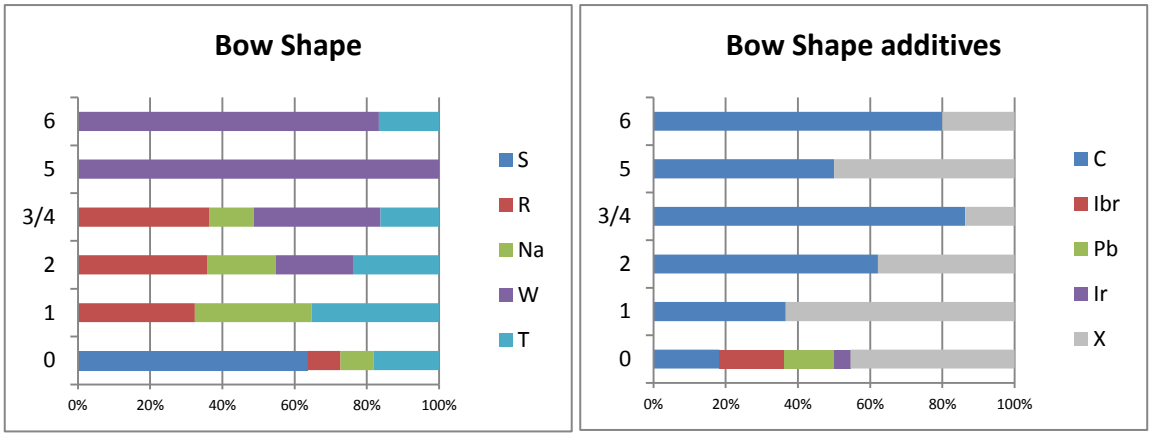


Figure 142 Variation in bow shape (left) and bow shape additives (right) sorted per type. Total amount of samples for the bow shape: 0 = 22; 1 = 34; 2 = 42; 3/4 = 74; 5 = 6; 6 = 6. Total amount of samples for the bow shape additives: 0 = 22; 1 = 30; 2 = 37; 3/4 = 66; 5 = 6; 6 = 5.

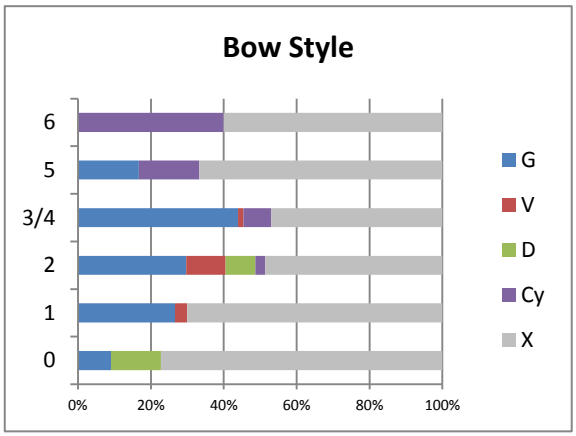


Figure 143 Variation in bow style sorted per type. Total amount of samples for the bow style: 0 = 22; 1 = 32; 2 = 37; 3/4 = 66; 5 = 6; 6 = 5.

On the added shapes (Figure 144), we can be brief: the intermissive base and/or rear and the protruding base are only found on type 0 brooches. Besides that, the cuff is always present and grows to become present in half to three quarters of the time in the later types. The shapes in which the cuff presents itself, although, is very varied. The regular cuff is common for all types, except 0 and 6, much like the small cuff, which can be seen on brooches of every type. Opposed to the raised cuff, which is only present in type 0, and the pronounced cuff, which is characterising for subtype 2iii (Swift 2000, 19). In addition to these shapes, there is also the contracted cuff, originating in type 1 and continuing on into type 6, with the exception of type 5. The final shape is the contracted cuff, which starts out as a very limited feature in types 2 and 3/4, but becomes the dominant shape

in type 6. Occasionally, an extra stylistic dimension is displayed in the cuff's shape or is added on as a motif. On the one hand, this consists of the leaf style, which occurs from type 0 to type 3/4 and peaks in type 2. On the other hand, this is presented in a geometrical style, present in types 1, 2 and 3/4 with a peak in the latter.

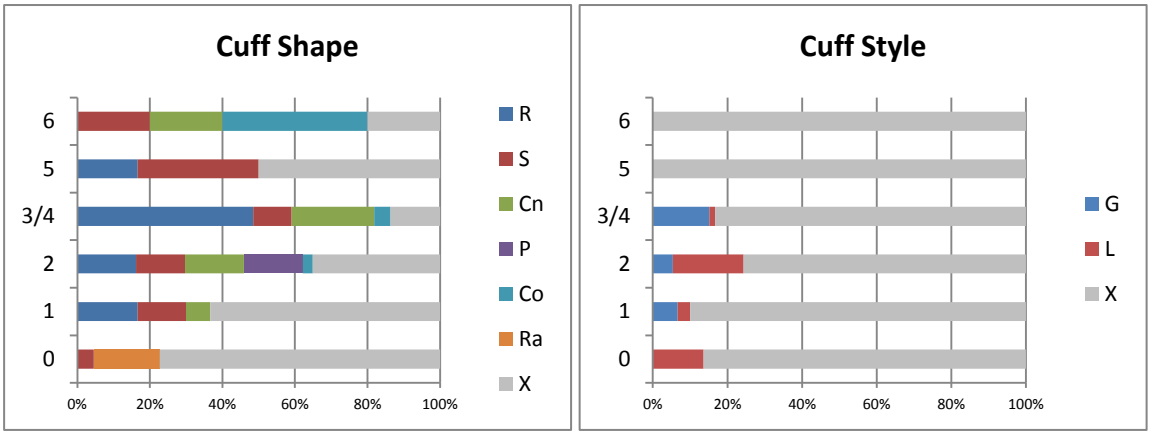


Figure 144 Variation in cuff shape (left) and cuff style (right) sorted per type. Total amount of samples for the cuff shape and cuff style: 0 = 22; 1 = 30; 2 = 37; 3/4 = 66; 5 = 6; 6 = 5.

The variables for the bow are less extensive as for the foot, and many trends or features show a resemblance, implying a stylistic connection between these two brooch elements. As mentioned before, this is possible related to the perception of the brooch when worn on the shoulder: the bow and foot would form an uninterrupted line to the observer, potentially creating a need for an transition or similarities to please the aesthetic aspect. In comparison with the foot, the most style and cuff variations do occur in types 2 and 3/4, however, the same variations in shape are present in types 0 and 1 as well. Moreover, the largest difference in shape additives occurs in type 0, after which the cuff is the only added shape present. Possibly this can be related to experimenting with the aesthetic, or a certain expressions, or simple related to the production process, since these brooches were fully cast and the later brooches were mainly assembled and cold-worked(see 8.1). The large variation in cuff shapes and styles can be an indication of personal freedom of the owner or producer and might very well be dependant of the allowed cost of the brooch. After all, the difference between a small or pronounced cuff is quite large and the cost and skill will have varied greatly in making a very fine and detailed cuff.

The arms

The arms have less variables to take into account (Figure 145 and Figure 146). There is the general shape of the cross section, the absence or presence of an added top and a limited

range of circular motifs. Originally, the most frequent arm shapes are equally divided between cylindrical and hexagonal. The cylindrical shape does not survive type 0, but the hexagonal shape remains the most common and most dominant in all types, except for type 3/4. Here, the quadrangular shape is the most occurring, which can also be commonly found on brooches from types 2 and 6, as well as sporadically in type 0. The pentagonal arms also belong to the original range of variations from type 0 and peaks in type 1, after which it gradually diminishes until type 3/4. The octagonal shapes are limited to types 1 and 2 in small quantities and the heptagonal shape is only a rare occurrence in type 1.

The absence of added elements dominates in the two earliest types and types 2 and 5 can also frequently be found without an added top, opposed to types 3/4 and 6 that always contain an added feature. The protuberancing top is limited to types 0 and 1, followed by the elevated shape present in types 1, 2 and 3/4. Both only occur in small numbers. The most common feature is the undulating top, that originates in type 1 and quickly grows to become the dominant top for all later types. Additionally, the mounted top also starts in type 1 and remains common in lower quantities up until type 6.

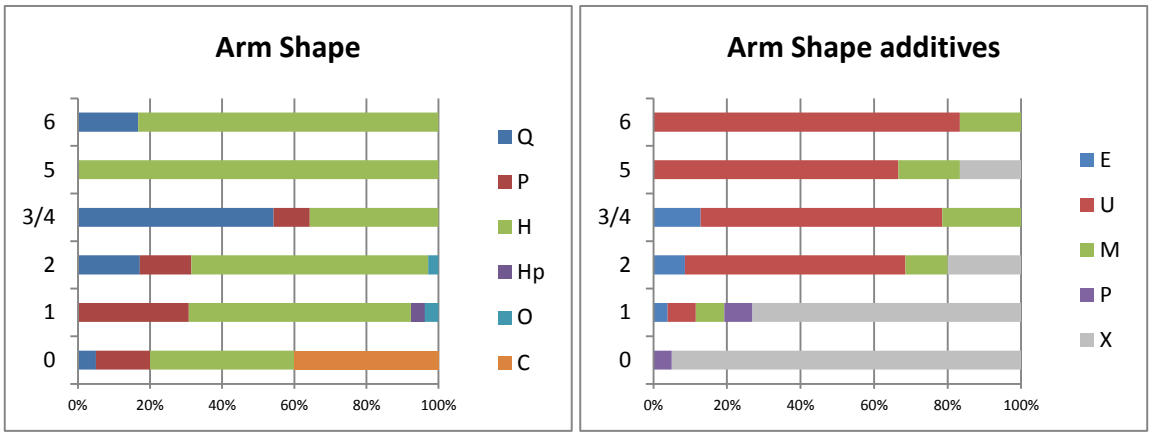


Figure 145 Variation in arm shape (left) and arm shape additives (right) sorted per type. Total amount of samples for the arm shape and arm shape additives: 0 = 20; 1 = 26; 2 = 35; 3/4 = 70; 5 = 6; 6 = 6.

The stylistic features are limited to two expressions of circular patterns: a single or double eye motif or perforation. The eye motif is earlier, originating in type 1 and growing to its peak in type 3/4, at which time it becomes a double eye that can commonly be found on type 6 brooches. The single and double perforation both begin in type 2 and they become more frequent in all the later types. Additionally, the perforations appear to be the preferred style for types 5 and 6. Furthermore, the single features dominate in types 2 and 3/4, whereas the double features dominate in type 6. A possible evolution from a

single eye motif to a double perforation throughout time seems plausible from this evidence.

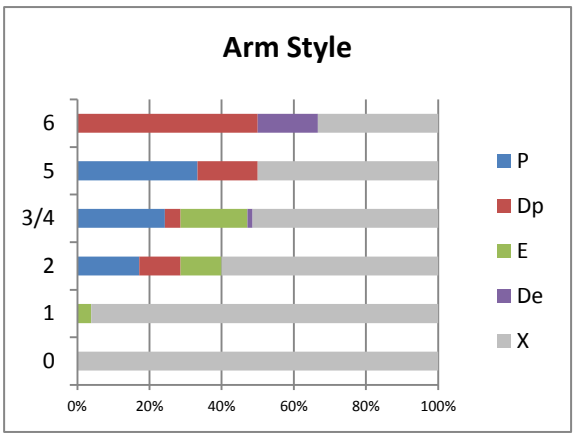


Figure 146 Variation in arm style sorted per type. Total amount of samples for the arm style: 0 = 20; 1 = 26; 2 = 35; 3/4 = 70; 5 = 6; 6 =6.

The main variation in the arms differs from the patterns we saw in the foot and the bow. Although the range in styles also contains the most variations in types 2 and 3/4, the shapes show a different trend. For instance, the variations in shape are equally distributed from type 0 to 3/4. Additionally, the most different shape additives can be found in type 1, but in very limited quantities. The range of variation diminishes for the other types, although the presence of an added top grows more common and becomes a fixed feature of the crossbow brooch. It is not clear why certain features became more popular than others, although aesthetics is probably the best explanation, given that an undecorated (angular) cylinder suffices for its function and is easier to make. However, while wearing a crossbow brooch, the details of the added shapes and applied styles and motifs would not have been visible very well. An alternative explanation is the expression of the skill of the producer or workshop and/or the cost of the brooch in both decorative features as well as the time necessary to create these detailed features.

The knobs

The knobs are like the foot the most stylistic features of the brooch and contain a whole scale of variations (Figure 147 and Figure 148). Due to the difficulty to distinguish different shapes from each other, it was chosen to work here with assemblages of related forms. Evidently, there is some overlap between these groups and some forms are clearly related, although put in a different group. Nonetheless, the resulting trends correspond with other studies and observations, concluding that this approach is accurate. The

brooches from type 0 are very distinct in the shapes and absence of knobs from the later types. The bow knob is mostly elongated, which does not occur in any of the other types. The arm knobs are mostly absent, although occasionally a shape from the ellipse group can occur. The ellipse group originates in the bow knobs from type 0 and peaks in type 1, after which it remains present in every type, although in progressively diminishing numbers. The shapes from the cone group find their origin in type 0 as well and are present in each type with a first peak in the type 2 brooches and a second peak in type 6. The onion-styled knobs occur from type 2 onward, dominate types 3/4 and 5, and are still commonly found in type 6.

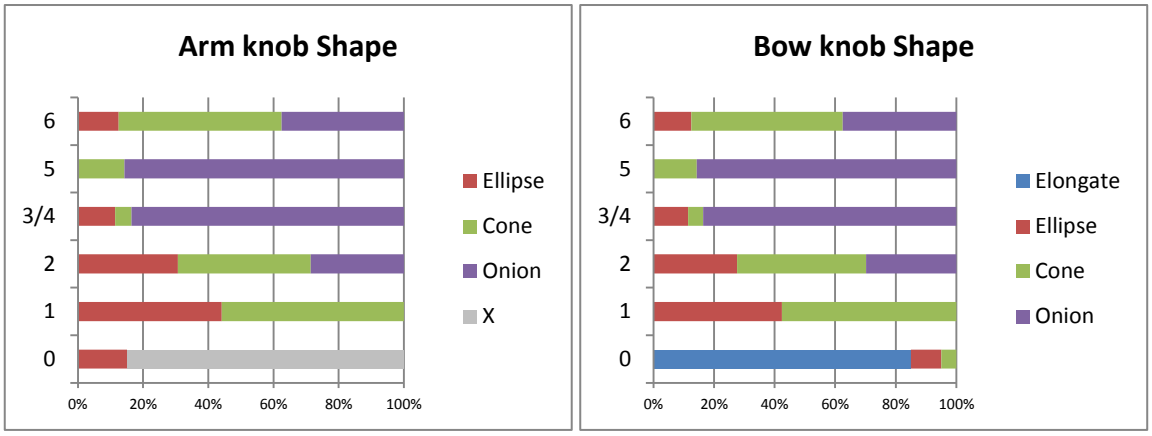


Figure 147 Variation in arm knob shape (left) and bow knob shape (right) sorted per type. Total amount of samples for the arm knob shape: 0 = 20; 1 = 34; 2 = 49; 3/4 = 79; 5 = 7; 6 = 8. Total amount of samples for the bow knob shape: 0 = 20; 1 = 33; 2 = 47; 3/4 = 79; 5 = 7; 6 = 8.

Finally, the added features associated with the knobs again are more absent than present. Most examples can be found on types 2 and 3/4. The base with geometrical design is the most common attribute and is found on types 2, 3/4 and 6. The double base originates from the type 0 brooches and peaks in type 1, after which it can very occasionally be found on type 2 or 3/4 brooches. The faceted base is very rare and is only encountered on one type 2 brooch. Even more exceptional, is the base with geometrical design and an added vegetational motif, encountered on a type 2iii brooch. The general variation in between these knob groups and the individual range of possible forms in these groups peak in types 2 and 3/4, consistent with the foot, bow and arm style observations.

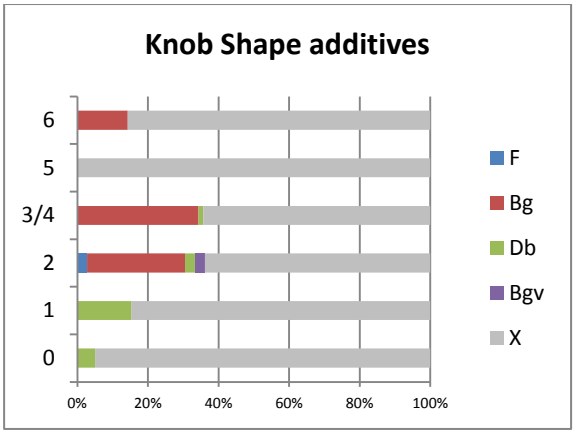


Figure 148 Variation in knob shape additives (right) sorted per type. Total amount of samples for the knob shape additives: 0 = 20; 1 = 26; 2 = 36; 3/4 = 70; 5 = 6; 6 = 7.

8.3.2.3 Change in size and ratio

In order to see if the established typology based on stylistic change is not merely an archaeological reality and can be used as an interpretative parameter to study the production and consumption of crossbow brooches, it is necessary to compare these findings with other methods. An additional simple method to handle in an object-based study is measuring. By measuring the dimensions of the complete brooch and its separate features, it is fairly simple to gain some insights on change and variation in the size of the brooch. Although, the dimensional proportions are connected to the style of the brooch, they are more closely related to the shape and the production process and thus less subjected to fluctuations due to design or personal taste. As we have seen, for example, in the stylistic evaluation of the arms, in which the variation in shape and style do not correspond completely. Additionally, it can be argued that the size is more related to the uniformity of the brooch than the shape or style. In this way, a second, perhaps less dynamic dataset with more comprehendible variables can support the general stylistic results to explore the changes in the production process further. The benefit of comparing dimensional measurements is that no complex statistics are necessary to investigate trends in size and ratio, simple descriptive statistics are calculated here by Microsoft Office Excel 2010 and the values used to examine change and variation in size are presented in Table 25. For typological or regional comparison of the measured values, the mode is given in addition to the average. The mode represents the most frequent occurring value in the corresponding dimension or feature acquired from the Low Countries crossbow brooches.

In this short case study, we first explore the averages (av.) of both total dimensions and the separate features throughout all types (Figure 149). After which the standard deviation (st.dev) delivers a first sense of the degree of variation, which will be observed more closely through the range between the minimal and maximal values. In general, the total dimensions – length, width and height – display a gradual increase in size. The average length starts at ±65 mm in type 0, increases to ±70 mm in types 1 and 2 and stays ±80 mm for the remaining types. Similarly, the width begins at a minimum of ±35 mm and takes a leap when the arm knobs start to consistently occur in type 1 to about ±45 mm. Types 2 and 3/4 have a slightly larger width of ±50 mm, followed by another increase to ±55 mm for types 5 and 6. Additionally, the height displays the same increasing trend, although more fluctuation is present. The initial height is approximately 25 mm and remains so in the first four types. Only types 5 and 6 have a slightly larger height of ±3 mm. The hypothesis that every separate part – the arm length, bow length, foot length and knob diameter – of the crossbow brooch increases equally in size appears evident, however, not correct. Merely the foot length and knob diameter are subjected to a linear growth. The foot length starts at just over 20 mm and takes two leaps through types 1 and 2 to arrive at ±40 mm for types 3/4, 5 and 6. Furthermore, the knob diameter displays a more gradual development, beginning at 5-8 mm to peak at 12-13 mm for types 5 and 6.

Table 25 Selection of descriptive statistics for the dimensions, features and length/width-ratio per type: average (av.), standard deviation (st.dev), mode, minimum value (min.), maximum value (max.) and range between maximum and minimum (range).

Type	n		Length	Width	Height	arm length	bow length	foot length	knob diameter	L/W ratio
0	15	*av.*	63,0	37,5	25,3	14,9	35,9	22,8	5,0	1,72
		st.dev	6,7	6,7	3,9	2,7	4,7	3,4	1,2	0,31
		mode	72	40	26	16	37	25	4	1,50
		min.	52	25	17	10	29	17	3	1,38
		max.	72	48	31	19	43	28	7	2,60
		range	20	23	14	9	14	11	4	1,22
1	18	*av.*	69,0	47,1	26,9	14,6	36,7	27,7	7,9	1,51
		st.dev	5,2	6,9	3,5	2,6	3,2	3,5	1,4	0,34
		mode	63	47	27	12	33	27	7	1,45
		min.	63	27	22	12	33	20	6	1,24
		max.	80	57	34	21	43	34	11	2,74
		range	17	30	12	9	10	14	5	1,51
2	29	*av.*	74,4	50,4	26,1	13,0	34,1	35,7	11,3	1,48
		st.dev	11,2	8,0	4,2	2,5	5,9	6,5	2,6	0,13
		mode	83	52	26	11	34	31	10	1,50

		min.	52	33	17	8	23	28	6	1,20
		max.	109	74	40	19	53	49	18	1,79
		range	57	42	23	11	30	21	12	0,59
3/4	60	*av.*	78,5	50,2	27,0	12,9	32,9	40,2	12,2	1,57
		st.dev	9,4	6,6	2,5	2,3	3,5	7,3	1,5	0,15
		mode	75	48	26	13	31	42	12	1,56
		min.	61	36	20	8	25	17	10	1,07
		max.	96	67	32	20	41	54	17	1,87
		range	35	31	12	12	16	37	7	0,80
5	4	*av.*	81,5	54,0	29,5	15,3	36,3	41,0	13,8	1,51
		st.dev	9,4	6,6	2,5	2,3	3,5	7,3	1,5	0,15
		mode	*	*	28	14	36	*	13	*
		min.	75	48	28	12	36	35	13	1,45
		max.	90	62	33	21	37	46	16	1,56
		range	15	14	5	9	1	11	3	0,11
6	4	*av.*	82,5	54,5	28,8	15,5	33,8	42,5	13,4	1,51
		st.dev	11,1	3,3	3,9	2,4	3,0	9,7	0,9	0,15
		mode	*	54	*	14	*	*	14	*
		min.	72	51	25	14	30	31	12	1,33
		max.	94	59	33	19	37	52	14	1,67
		range	22	8	8	5	7	21	2	0,33

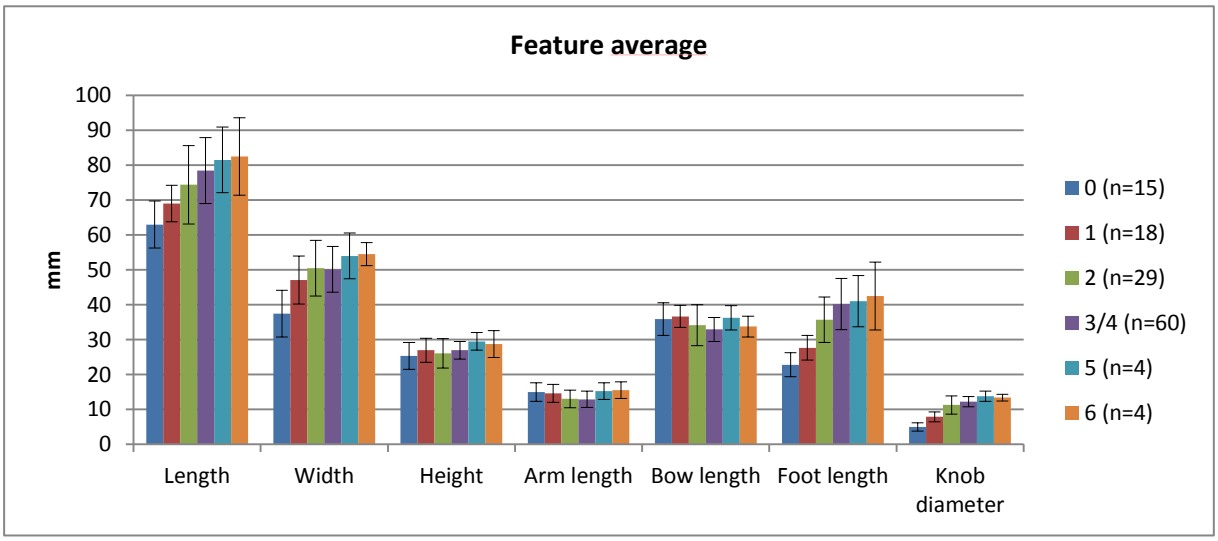


Figure 149 Variation in average dimensions and features per type. The standard error is expressed in the error bars.

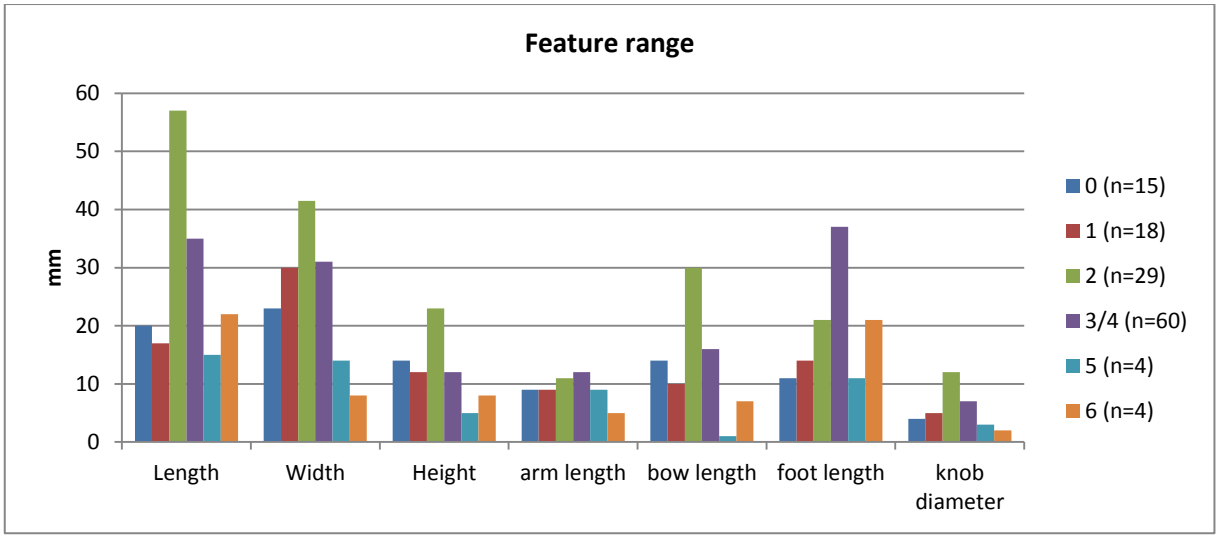


Figure 150 Variation in the range between minimum and maximum value of the dimensions and features per type.

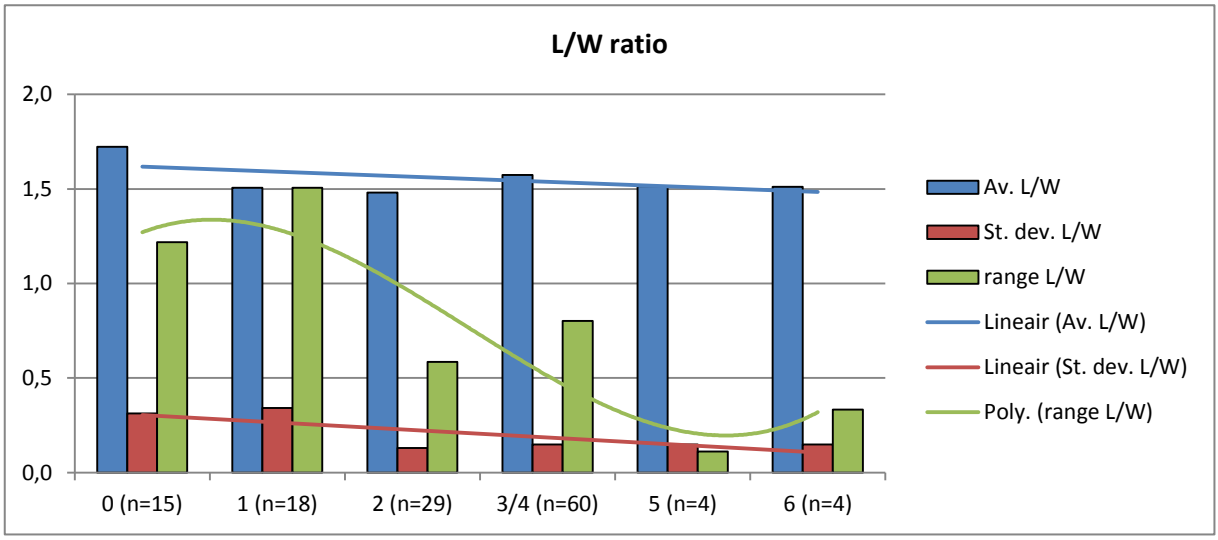


Figure 151 Variation in the length/width ratio per type with indication of the average (blue), standard deviation (red) and the range between minimum and maximum value (green) and the corresponding trends.

The standard deviation is expressed on Figure 149 by the error bars, indicating the degree of variation of each average. It shows us that the same feature varies more or less in different types or that different features express more or less variation within the same type. This behaviour is better observed by the range between the minimal and maximal values of each dimension and feature Figure 150. Here we first have to stress that this result is unfortunately biased by the number of finds per type, i.e. types 5 and 6 will consistently show less variation due to only a handful of brooches. In general, the highest degree of variation in the total dimensions is expressed in types 2 and 3/4 for the length, in types 1, 2 and 3/4 for the width and only in type 3/4 for the height. The image from the

separate features is more diverse. The arm length appears fairly constant, with most variation in types 2 and 3/4. Similarly, types 2, 3/4 and 6 display the most variation in the foot length. In contrast, the bow length only shows a peak in type 2, as well as a striking low degree of variation for type 5, even with the few measurements available. Finally, the knob diameter has the largest variation in type 2. Overall, type 2 expresses the highest degree of variation in size, followed by type 3/4. This corresponds with most observations in shape and style. It is difficult to assess the accuracy of the uniformity expresses by types 5 and 6, due to the small sample size. Although, sometimes a case can be made for a very striking difference, such as the very low variety in the arm length of type 5. Types 0 and 1 are more uniform in comparison to types 2 and 3/4: both are equal in degree of uniformity, although it is expressed in different features. The type 1 brooches appear to be slightly more uniform than the type 0 examples in the most functional attributes, e.g. the bow length and height, and display more variety in size in the more stylistic attributes, e.g. foot length and knob diameter. This can be seen as a transition towards the increase in variation in the following two types, potentially related to expressions of regionality or identity. Brooches from type 0 always come across as more uniform, due to their mould production and little alterations in their shape and size.

Another indication towards change in size applied here, and more related to the perception of these changes and differences, is the ratio of the total dimensions. The length, width and height make up the bulk of the physical appearance of the brooch and together they represent a single three-dimensional variable, which is automatically perceived by people upon sight. However, when worn, the dimension of height would be less perceptive and the height is less subjected to variation, as we have demonstrated above. Therefore, a two-dimensional ratio of the length and the width (L/W) is proposed as an extra tool to explore variation. This ratio is not only useful in a typological comparison, but is also a good indicator for investigating if the size differences in the brooches could be visibly perceived as different by an observer.

Figure 151 displays the average, standard deviation and range of the L/W-values (which can be found in Table 25), as well as the trends present in these three factors. The L/W-values are dimensionless values best applied in a relative context, i.e. values without unit and used in comparison with each other. The most frequent value is ±1.5, which means that the length is one and a half times larger than the width, e.g. if the width is 50 mm, the length will be (approximately) 75 mm. Types 1, 2, 5 and 6 approach the ideal 1.5 value, whereas type 3/4 diverges with a value of 1.57 and type 0 is the least conform with

a 1.72 value. After the initial drop from 1.7 to 1.5, the L/W-ratio proofs very consistent, only slightly interrupted by type 3/4. The standard deviation shows a more decreasing trend, indicating very little variation from the 1.5 value after types 0 and 1. This variation is better observed in the range, in which it is clear that there is still some variation on the average L/W-value in types 1 and 3/4, whereas the variation in types 2, 5 and 6 is rather low. Or better: the uniformity is very high. Not only do all brooches follow a general 'rule' of a fixed ratio between the length and the width, the 'rule' is quite strongly followed in most brooches of the same type. These results point to an underlying process of uniformity and control, despite the large variation visible in the shapes, styles and sizes. The hypothesis of the presence of a standardised production will be investigated further(see 8.4).

In all, we can conclude that the documentation and investigation of size and ratio is, in addition to the stylistic evaluation, a good contribution in a traditional object-based material culture study. The different trends in shape, style and size can be linked to multiple processes involving the production and consumption of the crossbow brooch. Dependant on the social context, people wearing this brooch wanted to express a specific message containing information on their social stature in the military or administrative establishment, and the dominating class to which this symbol belonged dictated what was accepted and what was not. Both freedoms and constraints are expressed in the appearance and production of the crossbow brooch, reflecting a contradiction that was ever-present in Roman society. This topic will be further discussed, after evaluating the results of the study of the production process.

8.3.3 Change in style in a sociocultural context

To a non-connoisseur of the typological development of the crossbow brooch, the stylistic and dimensional exposition can be hard to follow and to understand. In order to consider the implications of the results presented above and to connect with the contextual changes given in the cultural biography, we will review the major changes and their significance in a chronological order.

8.3.3.1 Change and persistence of stylistic traits

The many variables in the shape and style of the features reflect the contradiction or duality present in the crossbow brooch: simultaneously there is much variation and

change, while a continued use and (re)combination of the same elements occurs in the different types. This is caused by the expression of opposing processes of regionality and uniformity in the same object, although these processes are not always opposing (see 8.4.4).

Additionally, cultural transmission provides us with a conceptual framework to help us understand stylistic variants in material culture by looking at the persistence, innovation or invention of traits (de Voogt, Dunn-Vaturi and Eerkens 2013, 1715-1716). The persistence and innovation of stylistic traits can be understood as expressions of uniformity, regionality and identity. In the Low Countries crossbow brooches, we see that the largest variations are expressed in types 2 and 3/4, whereas the most uniform design is displayed in types 0, 5 and 6. For types 5 and 6, we can argue a bias due to the limited number of examples. The explanation for type 0 brooches lies in its more simple design, its cast production and probably origin as part of a soldier's uniform(see 8.2), making the high degree of uniformity expected. Types 1 and 2 exhibit the highest quantity of new shapes and styles, e.g. the circle and dot style or the undulating arm top, while at some degree they maintain earlier elements, e.g. the small cuff or the ellipse shaped knobs. Many elements prove successful and live on into types 3/4, 5 and 6, e.g. the tapered foot or the double perforation, while others cease on their peak in type 3/4 without evident cause, e.g. the extended rear or the elevated arm top. Other decorative elements were quite unsuccessful and are found in only a small number of examples and disappear only after only one or two types, e.g. the octagonal arm shape or fan foot style.

The change and persistence of stylistic traits (Figure 139) show a more complex image than a mere linear progression of features, in accordance with Swift's evolution model of the crossbow brooch (2000, 27): the large variety of features present in types 2 and 3/4 relate to most elements in the later types, however, usually brooches from type 5 and 6 do not favour the same elements. Supporting the conclusion that types 5 and 6 are a parallel rather than a successive development. Additionally, types 1 and 2 can be seen as transitional groups between type 0 and type 3/4, 5 and 6. Moreover, it is clear that the types from the later 4th century, such as 5 and 6, are significantly different from the 3rd century types: 0 and 1.

It is tempting to interpret this pattern as a Gaussian bell curve with the rise of the crossbow brooch from the general bow brooch class in the second half of the 3rd century (types 0 and 1), becoming increasingly popular and successful in the first half of the 4th century, as shown from the large introduction of new shapes and styles and their wide

variety (types 1, 2 and 3/4). Followed by the peak in its life history, as the top of the curve as it were, in the middle of the 4th century characterised by the military intervention in the need for uniformity and recognisability together with the state-controlled production and largest distribution all over the Late Roman Empire. And subsequently, declining towards the end of the 4th century and the first half of the 5th century with a drop in numbers and limited distribution. However, the problem here with the general 'rise-peak-decline' notion (present in many Late Roman studies) is that the only decline in the crossbow brooch, are its numbers. In all other aspects – size, decoration, skill, cost – the 4th-5th century transition sees a new splendour for the crossbow brooch, developing into objects only the most skilled metal craftsmen could produce in the 6th century (for examples see Deppert-Lippitz 2000). Even its distribution is not as limited as it appears, with brooches found in every corner of the Empire, as well as outside its borders, such as the Childeric and Apphida brooch(see 8.2.6). For now, it suffices to state that stylistically there appear to be two major changes or innovations in the crossbow brooch's life: the first is the introduction of new styles and shapes after type 0, which sets the crossbow brooch apart from the other bow brooches, and the second at the 'peak' of the curve before the development into types 5 and 6. Both these major changes were triggered by change or transformation in sociocultural context of the owners of the crossbow brooch.

8.3.3.2 The crossbow brooch evolution: innovative or conservative?

To fully work towards understanding the stylistic changes of the crossbow brooch, it is necessary to place them in their proper sociocultural context, as derived from the cultural biography. The origin of the crossbow brooch can be placed in the 3rd century, although, the exact circumstances and date of their emergence from the general class of bow brooches is still unclear. The lack of direct iconographic and historical evidence combined with their abundant archaeological presence in a military setting, suggests that their owners in the 3rd century belonged to a lower military class. The overall stylistic and spatial distribution (Swift 2000, 30-34) indicates a potential origin in the Danube provinces, although Pauli (2013, 402-411) discerns a separate British subtype ('Richborough'). Furthermore, the simple design of the type 0 brooches displays the least variation in shape, style and size, suggesting a high degree of uniformity. However it has to be stated, that this observation is made only in comparison to the later crossbow brooch types. To fully comprehend if the type 0 crossbow brooch is a conservative bow brooch or already an innovation towards the highly symbolic 4th century crossbow

brooch, it is crucial to investigate this type in a general 2nd and 3rd century (bow) brooch context. We have to be careful in applying the benefit of hindsight and make sure not to read an origin story fitting for the later narrative into this early crossbow brooch type. For instance, the bow shape and shape additives show a higher degree of variation than the later types and the high variation in the length/width ratio both point to a lesser amount of uniformity than initially thought. This can be related to differences in batch production in different workshops, although from this study it is unclear if this is common or exceptional for 3rd century bow brooches.

The next phase in the life of the crossbow brooch is the transition from the 3rd to the 4th century, corresponding with the Tetrarchy and the Constantinian dynasty. It is in this phase that type 0 disappears and type 1 and 2 occur, partially overlapping in chronology. Their main archaeological context is still military, although the appearance of iconographic evidence and the gradual shift towards mainly burial contexts indicate a change in their symbolic value towards a dual social message: anonymous military members vs. recognisable public officials. The former can be thought of as the rather simple and uniform type 1 and 2 brooches, possibly reflected in the persistence of traits from type 0. The latter is displayed best in the highly decorated and inscribed brooches and potentially connected to the high degree of variation and the introduction of many new shapes and styles. The stylistic overlap between type 0 and type 1 (and possible some early type 2) brooches argues for a continued uniformity and recognisability. In contrast, the rising degree of variation peaks in type 2 brooches with the most variety and diversity in the total typological spectre. However, the length/width ratio expresses a decrease in the variety of the general shape, conform with the '1.5-ratio'. It is not surprising that the duality in the social context is reflected in the physical properties of the brooch. We might suggest that the conservative traits, i.e. persistent from type 0 throughout the 3rd-4th century transition, are still connected with (lower) military classes, displayed as anonymous members in the iconographic record. In addition, the innovative traits, i.e. the introduction of new shapes and styles, can be viewed as a new class of more wealthy owners being influenced by the advance of military officers in social ranks, although distinguishing themselves by expressing their higher status and wealth in their dress accessories.

This process continues on into the 4th century, predominated by type 3/4, although overlapping with type 2 as well. Swift proposed the type 3/4 as the mainstream trend, associated with imports from the *Pannonian fabrica* and the simultaneous type 2

remainders mainly as parallel regional developments. However, from the stylistic evidence presented here, we see a persistence in the high degree of variation, even though expressed in different features (such as the decorative focus on the foot style in type 3/4). Additionally, the degree of uniformity expressed in the ratio of the general shape supports the claim for type 3/4, although this is already present in type 2 as well. In all, most traits appear to be conservative in nature, without only a new introduction on very rare occasions. So despite the high degree of stylistic variation, the degree of uniformity seems to be in stasis for the first half of the 4th century. The increased number of finds from this period is probably partially biased due to the depositional shift towards burials and its increased significance, making it less likely to be discarded or recycled.

The final development traceable through the brooches from northern Gaul, is the transition from the 4th into the 5th century. Iconographic evidence show an increased preference to display individuals of power and prestige with crossbow brooches, often state officials performing their duties, as is resembled in the consular diptychs. In addition, the historical references give us an indirect indication that the former 'military garb' was widely adopted in the civilian official ranks while performing their tasks. In the archaeological record, we see a persistence of the type 3/4 (possibly also type 2?), while alongside types 5 and 6 develop separately, but somewhat parallel, tied to changes in production and workshops. The ties to types 2 and 3/4 are expressed in the conservative nature of the stylistic traits: no new shapes or styles emerge, only existing styles develop. Furthermore, type 5 and type 6 differ in which traits are developed further to the point in which they appear very much distinct from each other. Although, the low degree of variation and the conformity to the '1.5-ratio' point out their uniformity to each other and the previous types. Arguably we can state that the crossbow brooch as an object does not change in the second part of the 4th century, but is redefined by the major military influence in the Late Roman elite, and more importantly, in their position of high ranking state officials. No longer can a crossbow brooch be associated with anonymous military members, but are intended to serve as a recognisable symbol of state authority. Hence, the simultaneous expressions of uniformity and variation. Though, it has to be stressed here that this duality is different from the previous earlier 4th century ambiguity: during the Tetrarchy and the Constantinian dynasty the brooch was worn by members of two separate (although related) social backgrounds, whereas from the Theodosian time onwards it served only for individuals from the same elitist class.

8.4 An archaeometrical contribution to a life history

The archaeometrical analyses performed here are the final layer of information[24], to regard on an equal base with the information that was presented in the cultural biography and the stylistic observations. In this section the production of the Low Countries crossbow brooches is investigated by two non-destructive analytical techniques, exploring matters of composition and dimensionality related to expressions of regionality, state-controlled production and expression of the identity of both producers and consumers. The most significant results will again be compared with the changing sociocultural context for Late Roman northern Gaul.

8.4.1 Aims, methods and sampling

First, this part aims to test the existing 'style-distribution' production model of the crossbow brooch (see 8.1.2) on a regional scale, by combining chemical and metric analyses. The second objective is to evaluate its changing production dynamics within the larger sociocultural transformations of the Late Roman empire. The collected 185 samples from 12 different sites in northern Gaul (Figure 98) encompass all existing variations for the entire life history of the crossbow brooch in this region, from the 3rd to the 5th century.

The chemical analysis on the brooches was performed by a commercial handheld X-Ray Fluorescence (hXRF) instrument (Olympus InnovX Delta). A Rh-target based X-ray source produces a polychromatic X-ray beam allowing to record elemental information from approximately a 5x5 mm² sample area by means of a silicon-drift detector. The experiments were conducted in air using a shielded chamber, with 40 kV/79 mA tube voltage/current and 300 sec measurement time. Special care was taken to optimise the selected areas on the samples: if needed, corrosion was removed by fine manual cleaning using a scalpel. Evaluation of the individual XRF spectral data was performed using the AXIL (Analysis of X-rays by Iterative Least Squares) software package that allows a

[24] This part of the chapter is based on the article Van Thienen, Lycke From commodity to singularity: the production of crossbow brooches and the rise of the Late Roman military elite (submitted on April 16, 2016 to the Journal of Archaeological Science).

mathematical description of the fluorescence peaks and the spectral background (Vekemans, et al. 1994). Further data processing involved multivariate statistical methods to investigate groupings by means of Principal Component Analysis (PCA) and Hierarchical Clustering Analysis (HCA), using Ward's Method with squared Eucledian distance, standardised with Z scores, carried out in IBM SPSS 23 software. Due to corrosion and/or contaminants, from the original set of 185 brooches, only 138 brooches remained for further statistical data processing. A comparative framework to this data set is provided by data from 5 known copper alloy reference materials (Table 26). These reference materials were additionally analysed by the same hXRF device and the results were taken into account to determine the alloy classification (Table 27) that represents the different alloy types encountered in the archaeological samples.

The metric data was compiled by measuring the total (length, width, height) and partial dimensions (the maximal diameter of the knobs and the length of the foot, bow and arm) of each artefact (Figure 129Figure 129 Crossbow brooch (type 3/4) from the 4th century military burial at Oudenburg, with indications of the terminology. Total dimensions include length, width and height. Separate features contain the arm length, bow length, foot length and maximal knob diameter.). To investigate the typologically related variation and to estimate the degree of standardisation, first, a second multivariate data processing with PCA was carried out on the dimensional data. Followed by calculating the standard deviation of the mean (STdev) for each typological group by dividing the standard deviation (s) of the group by the square root of the number of brooches (n) in that group (STdev= $s/\sqrt{n}$). Second, the coefficient of variation (CV) was calculated for each attribute per type, by dividing the standard deviation (s) by the group average ($\overline{x}$) to explore the varying degree of variation and control throughout the life history of this artefact type. Due to fragmentation, of the original set of 185 brooches, only 126 complete brooches were available for the multivariate data processing, although the coefficient of variation (CV) could be calculated for 152 brooches.

8.4.2 Composition and typology in search of regionality

Portable XRF is a common technique in the non-invasive study of copper-alloy artefacts (e.g. Kearns, Martinón-Torres and Rehren 2010; Martinón-Torres, et al. 2012; Elia 2013). The limitations and difficulties of surface analysis on copper alloy artefacts are well known and have been taken into account (Nicholas and Manti 2014). Therefore, priority

has been given to investigate trends related to regionality, typology and chronology, rather than focus on the exact compositional nature of the metals artefacts. First, the general pattern of the major elements (Cu, Sn, Zn and Pb) among the Low Countries crossbow brooches was explored in order to determine their composition and potentially uncover a regional fingerprint or a link with state *fabricae* imports. The main overall observation is that the detected tin levels are relatively low compared to zinc and lead (Figure 161). The strong presence of lead contains important information concerning alloy mixing, recycling and access to 'fresh' resources can be derived from the lead content. For example, lead was used to substitute the evaporating zinc in the recycling of brasses or was employed as an additive to improve the casting process (Elia 2013; Pollard, et al. 2015). Additionally, the recent study of Bray et al. (2015) made a distinction between primary or recycled bronzes based on the distribution of tin in a certain region. In this case, the low tin levels would be indicative for recycled alloys.

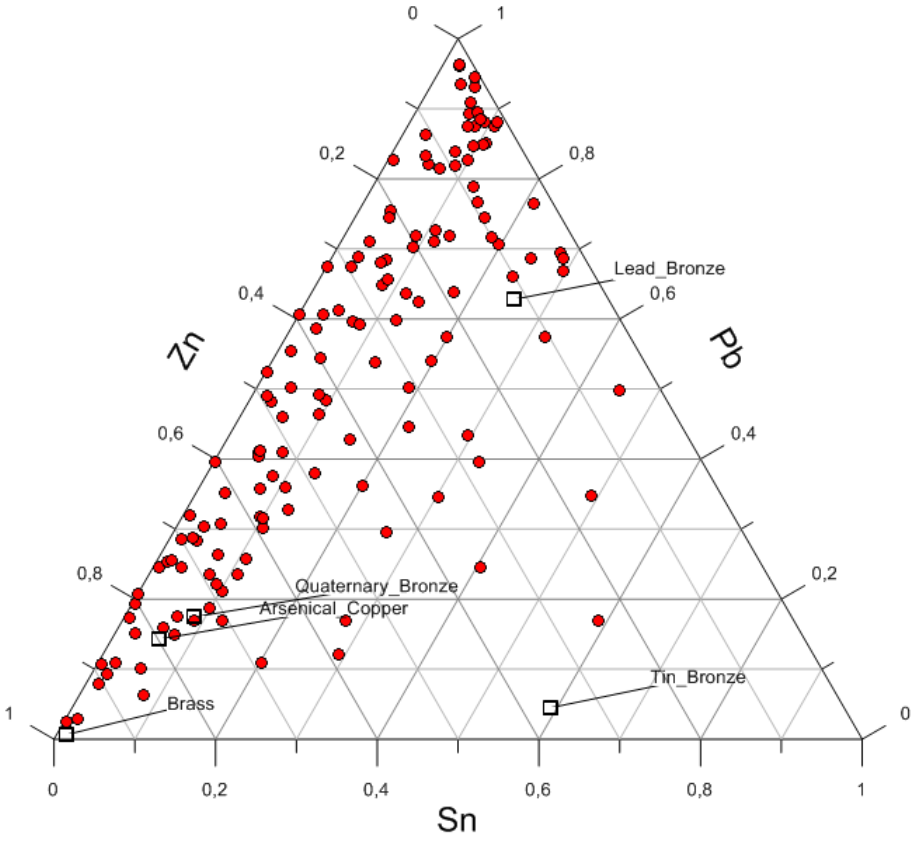


Figure 152 Ternary diagram representing the average elemental net peak areas per brooch (dots). The values for Sn, Zn and Pb are normalised with Cu. The reference copper-alloy materials (Table 26) (squares) are added to the diagram.

Table 26 BCR certified reference materials: the reference values and the measured values for 5 copper alloy reference materials provided by the Royal Institute for Art, Belgium (Koninklijk Instituut voor Kunstpatrimonium). The measured values are obtained by the same hXRF device that was used to analyse the crossbow brooches.

		Reference values				Measured values			
ID	Alloy name	Cu	Zn	Sn	Pb	Cu	Zn	Sn	Pb
BCR691A	Quaternary Bronze	78.73%	6.02%	7.16%	7.90%	90.57%	6.96%	0.82%	1.65%
BCR691B	Brass	82.74%	14.80%	2.06%	0.39%	85.87%	13.86%	0.18%	0.09%
BCR691C	Arsenical Copper	94.98%	0.05%	0.20%	0.17%	99.56%	0.35%	0.03%	0.06%
BCR691D	Lead Bronze	80.27%	0.15%	10.10%	9.20%	95.76%	0.50%	1.08%	2.66%
BCR691E	Tin Bronze	92.45%	0.16%	7.00%	0.20%	98.69%	0.48%	0.78%	0.06%

Despite, the lack of accepted 'fixed boundaries' for alloys used in Antiquity and the current discussion on the importance of exact compositional values, identifying the alloy composition is necessary and related studies were consulted in defining a proper classification (Dungworth 1997; Bayley and Butcher 2004; Kearns, Martinón-Torres and Rehren 2010; Pollard, et al. 2015). The life history method surmised by Pollard et al. (2015) was valued most and used to create the alloy classification applied here (Table 27). Some adjustments were made to compensate for the surface analyses by hXRF, i.e. the lower detection of tin and the heightened presence of zinc, as can be seen in Table 26. From the ternary diagram (Figure 152), it is clear that these brooches cross modern alloy boundaries. It has been suggested from similar observations that this absence of clear-cut alloys indicates recycling or the mixing of alloys in creating quaternary alloys (Bayley and Butcher 2004; Dungworth 1997; Pollard et al. 2015). The reference materials included in the diagram are modern alloys and could therefore not be used as a direct indication for the intended Roman alloys, but rather serve as an indication of the compositional nature of the brooches. A similar lack of clustering presented itself after performing multivariate data processing on the major elements (Cu, Sn, Zn, Pb): potential groups overlap and can hardly be separated based on the acquired elemental signal (Figure 153). The minor elements were not included here, given their unreliability in surface analyses by hXRF. However, it can be argued that the PCA plot PC2 versus PC1 is dominated by the presence or absence of zinc: the group without zinc contains a tight cluster related to copper and a loose grouping characterised by mainly lead and tin (Figure 154). The HCA results generally confirmed the PCA model. This observation seems to correspond with recent results relating to copper alloy recycling and reuse in the Roman period (Pollard et al.

2015). Unfortunately, we were not able to fully investigate the aspect of recycling regarding regionality and state production here, which remains to be explored further.

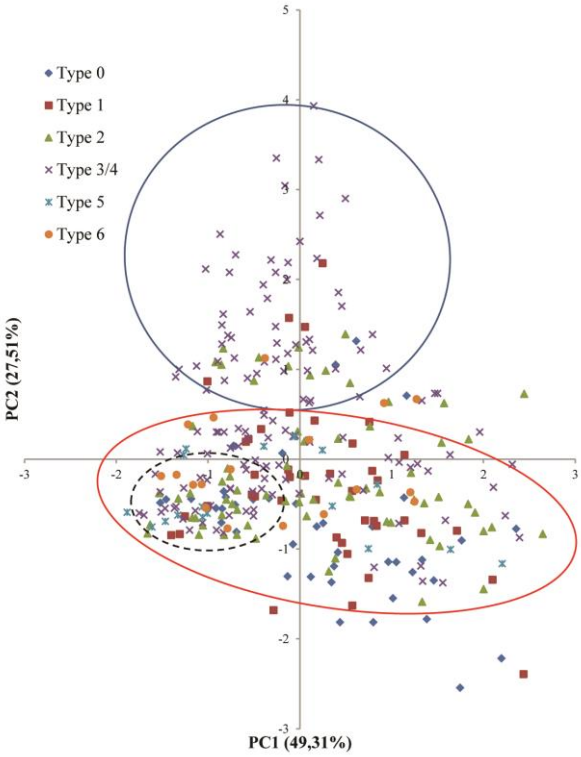


Figure 153 PCA scoreplot (PC2 vs PC1) of the XRF data with typological labelling and the indication of the Zn-group (blue circle), the Pb-Sn group (red circle) and the tight clustering related to Cu (dashed lined circle).

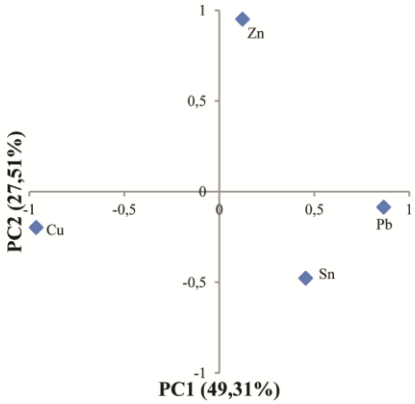


Figure 154 PCA loading plot (PC2 vs PC1) of the XRF data with the major elements: copper (Cu), tin (Sn), zinc (Zn) and lead (Pb).

It is important to note that chemical analyses based solely on compositional patterns do not deliver conclusive results allowing for an identification of regional or imported products. To make this next step, archaeological information is required. It is known from other brooch types that the composition can alter between (sub)types, such as with the

Colchester A and B brooches (Dungworth 1997). In this case, the typological model of Keller-Pröttel-Swift serves as a decisive factor to clarify the chemical results. Keeping in mind that the alloy-boundary-transgressions make Figure 155 less reliable, we can see that the complete alloy range is represented in every type. The major trends consist of a general reduction of bronzes, a peak in brass for type 3/4, a fluctuating presence of gunmetal and an increase in unalloyed copper for types 5 and 6. Brass has been suggested to be connected to military equipment made by a "state monopoly" (Dungworth 1997), implying a larger input of state imports for type 3/4 in the region. The larger percentages of unalloyed (leaded) copper in types 5 and 6 are possibly related to a distinct copper source or the practise of gilding (Bayley and Butcher 2004), corresponding with the larger detection of gold in these types (Figure 156).

When we incorporate these results in the style-distribution production model (see 8.1.2), it is evident that there is no clear compositional distinction between the main production line and smaller divergent groups for the region of northern Gaul. Although, based on the evidence from Britain, Swift proposed a distinction between two main compositional groups (Bayley 1992; Swift 2000). The group characterised as 'leaded bronze' indicated an origin in Britain and the 'brass/gunmetal group' pointed to a Continental origin, possibly from the Danube area (*Pannonia)*. An exception was the type 6 brooches belonging to the leaded bronze group, but with stylistic features from the continental West. Arguably, the two main groups visible in the PCA-plot (Figure 153) coincide with these observations: the zinc-driven group matches the 'brass/gunmetal group' and the 'leaded bronze group' corresponds with the lead-tin defined group. Moreover, the latter can be subdivided into a cluster dominated by copper and a cluster represented by lead and tin. There is no mention of a 'copper group' from the British brooches, implying a distinctive local/regional signature for northern Gaul, which coincides with part of the area Swift refers to as 'West of the Rhine'. The copper group presents itself mainly as 'unalloyed (leaded) copper', which could be related to the gilding process. Except that brooches of this compositional nature are represented in all types (Figure 155), including type 3/4, which rarely contains gilded examples (Figure 156). A connection to a 'fresh' copper source is also likely (Pollard et al. 2015) and remains to be investigated further. Moreover, there is an attested link between the brass/gunmetal group and the stylistic features from the Danubian area, suggesting that the brass/gunmetal group represents products from official *fabricae*, as is indicated by the use of brass in state facilities producing military equipment. Additionally, the implication

arises that the leaded bronze group is not necessarily associated with British products, but with products from non-state workshops, i.e. most likely local or regional in nature. This could explain the leaded bronze composition for the type 6 brooches in Britain.

Table 27 The applied alloy classification is based on the studies of Bayley and Butcher (2004), Dungworth (1997), Kearns et al (2010) and Pollard et al (2015). The method of Pollard et al proved the most useful, however, some adjustments were made to take the accuracy from the surface analysis by hXRF into account, as is shown in Table 26.

Name	Definition
Copper	Pb, Zn both <1%; Sn <0.5%
Leaded copper	Pb >1%; Sn <0.5%, Zn <1%
Bronze	Sn > 0.5%; Pb, Zn both <1%
Leaded bronze	Sn >0.5%, Pb >1%; Zn < 1%
Brass	Zn >5%, Sn <0.5%, Pb <1%
Leaded brass	Zn >3%, Pb >1%; Sn <0.5%
Gunmetal	Sn > 0.5%, Zn >3%; Pb <1%
Leaded gunmetal	Sn > 0.5%, Zn >3%; Pb >1%

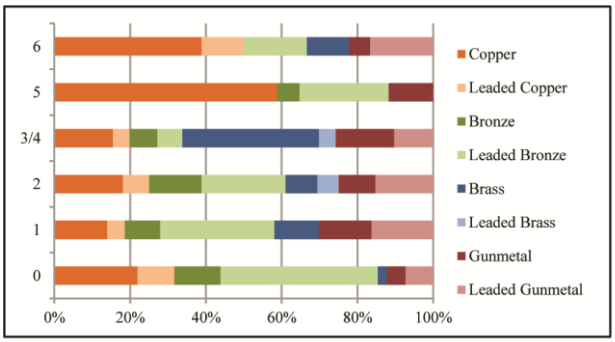


Figure 155 General trends in alloys per type. Alloys are allocated as indicated in Table 27. Total amount of valid measurements per type: 0 = 41; 1 = 43; 2 = 72; 3/4 = 136; 5 = 17; 6 = 18.

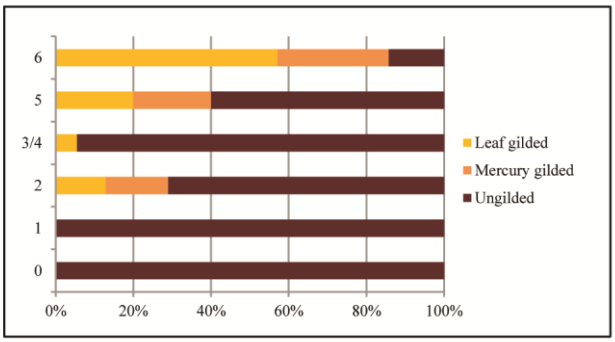


Figure 156 Indications of gold and gilding per type: based on the presence or absence of Au and Hg in the XRF-spectrum. Total amount of valid measurements per type: 0 = 16; 1 = 24; 2 = 22; 3/4 = 52; 5 = 3; 6 = 1.

8.4.3 Dimensionality and variation to support controlled production

In order to explore the relationship between typology and production further, the crossbow brooch dimensions have been investigated in search of potential requirements, limitations or freedoms regarding its shape and size. The total dimensions include the length, width and height of the brooch and the separate features consist of the lengths of the arms, bow and foot as well as the maximal knob diameter (Figure 129). Multiple groups emerged from performing PCA: one main group, comprising of types 2 through 6, and one or two distinct group for types 0 and 1 (Figure 157). These separate sets of dimensions indicate a change in requirements in the brooch shape. Despite poor clustering, a shift is clearly visible. To explore the validity of this shift, the standard deviation of the mean was calculated (Figure 159). Mainly the values of PC1 strengthen both the division between types as well as the shift, although the connection between types 5 and 6 is remarkable, as well as their overlap in error bars of PC1 with type 3/4. The significance of this will be discussed further. This result supports the use of feature dimensions to distinguish between different types, which could prove to be an additional tool for future typological classification.

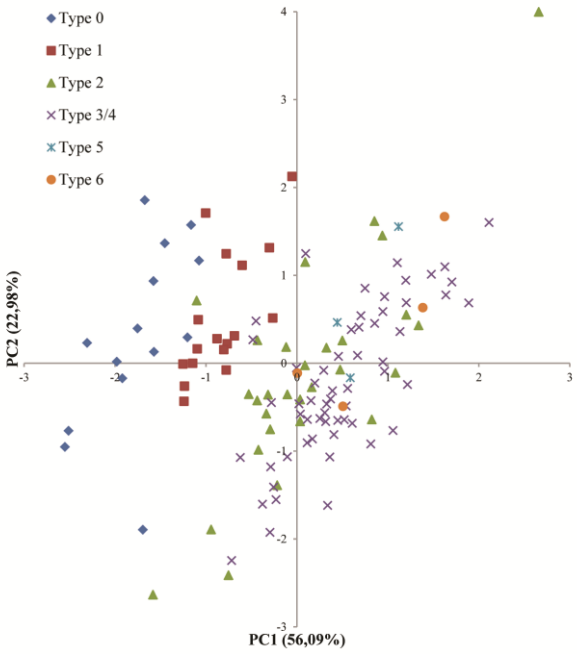


Figure 157 PCA scoreplot (PC2 vs PC1) of the metric data performed on all dimensions.

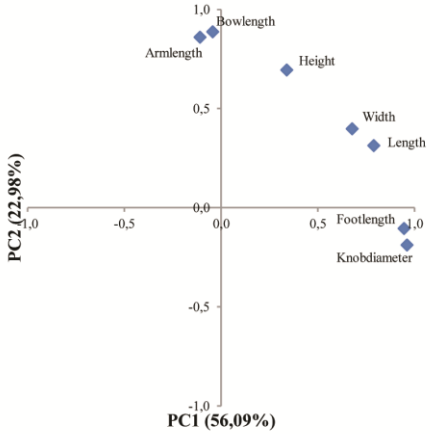


Figure 158 PCA loading plot (PC2 vs PC1) of the metric data performed on all dimensions.

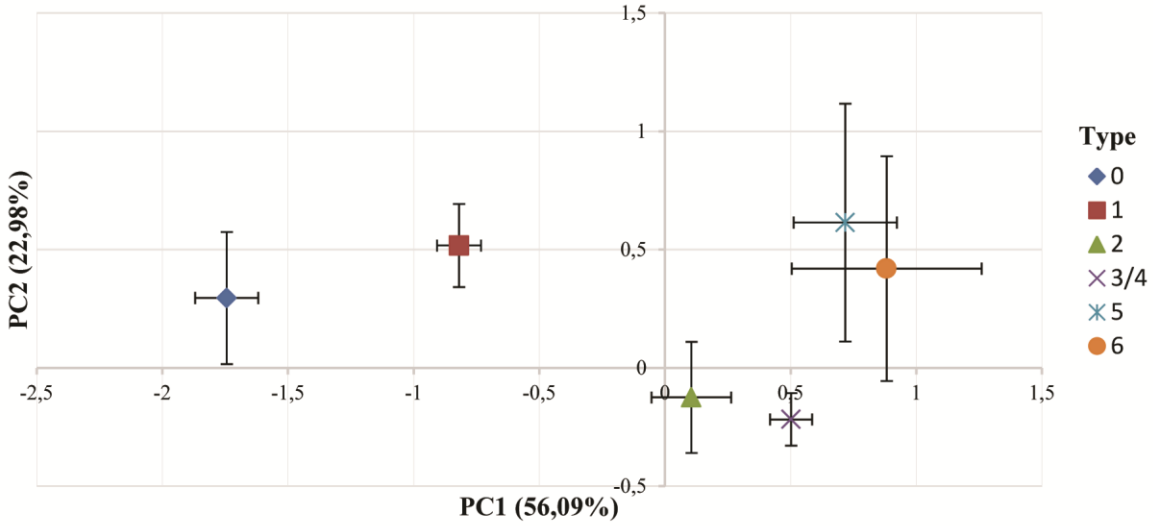


Figure 159 Standard deviation of the mean for PC2 vs PC1 on the metric data from all dimensions and features from the typological groups (STdev=s/vn).

A second approach focussed on examining the changes in variation and control in the production by means of comparing the coefficient of variation (CV) for the dimensional data. Since the adoption of psychological concepts on the limitations of human perceptual capacities in archaeological cultural transmission studies (Eerkens 2000), CV has been increasingly applied in artefact studies to investigate variation, control and change over time, both for dimensional and stylistic properties (Eerkens and Bettinger 2001; Underhill 2003; Eerkens and Lipo 2005; Martinón-Torres, et al. 2012; de Voogt, Dunn-Vaturi and Eerkens 2013; Lassen and Williams 2015). In this study, CV is used to investigate two objectives: the first is to explore the degree of variation or control between the types, revealing information on differences per type. The second is to identify the degree of variation/control on the different features, in order to assess the impact of the stylistic changes through time. The dimensional variation is interpreted by using the 'Weber fraction' (5% for production) and the 'random uniform line' (RUL) (57.7%) as indicators for the degree of variation/control (Eerkens and Bettinger 2001).

In general, the average CV values per type and per feature (Figure 160 and Table 28) are both well above the Weber fraction, but also do not approach the RUL, indicating an overall stronger degree of control. Furthermore, the varying degree of variation/control per type demonstrates a gradual increase in CV for the first three types, whereas the last three types have noticeable lower values (Figure 160). The average values do not fit the general notion of standardisation (Eerkens and Bettinger 2001), however, certain factors that increase CV values have to be taken into account. First, the multidimensionality of

the crossbow brooch makes it a complex object with more chance for error. Second, this brooch has simultaneously a functional and a stylistic nature, which is affected by both design tolerance and constraint. Additionally, multiple workshops actively produced these brooches at the same time, resulting in a number of craftsmen, with different skillsets, working together or separately on these brooches. So in all, the average CV values between 10 and 15% are chosen here to be understood as a high means of control that could be construed as standardisation.

To assess the impact of the changes in shape and style on the manufacture, the variations for each dimension are compared. In average, the total dimensions have lower values than the separate features, with the exception of the bow length (Figure 160). Despite the higher variation present in the different features, the total dimensions show a tendency towards standardisation (10-15%), indicating a manner of compensation: i.e. if one feature is disproportional, mainly for stylistic reasons, other features are adjusted to fit the required overall shape. This supports the impression that the production of crossbow brooches was subjected to strong regulations. Compared to the 53%-74% CV average for the bow width from Bronze Age brooches from the Eerkens and Bettinger study (2001), the crossbow brooch values are extremely low. This high level of conformity is related to its need to be recognisable as a symbol of Roman authority (see 8.2).

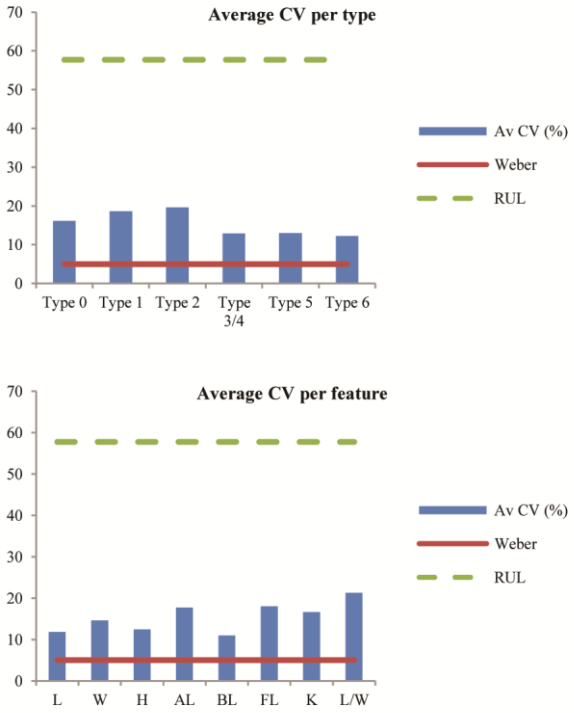


Figure 160 Average CV per type (top) and per feature (bottom), with indication of the Weber fraction (5%) and the random uniform line (RUL, 57.7%) as constants.

Table 28 Values for the coefficient of variation (CV) and average dimension in mm (x) for each feature per type (CV=s/x) (for the full information on the measurements see Appendix 4).

		Length	Width	Height	Arm length	Bow length	Foot length	Knob diameter	Av. CV per type
Type 0	*x (mm)*	63.00	36.05	25.90	15.55	35.61	22.75	4.84	
	CV (%)	10.66	18.97	14.55	16.36	12.11	14.58	24.11	15.91
Type 1	*x (mm)*	68.33	46.27	26.73	14.54	35.41	27.71	7.88	
	CV (%)	8.67	16.41	12.81	15.44	10.31	18.11	18.75	14.36
Type 2	*x (mm)*	74.43	50.03	26.63	13.00	34.15	35.67	11.32	
	CV (%)	14.78	17.42	16.47	18.84	16.99	17.45	21.07	17.57
Type 3/4	*x (mm)*	78.43	50.15	26.95	12.87	32.92	40.16	12.13	
	CV (%)	11.91	13.21	9.22	18.19	10.60	18.16	12.36	13.38
Type 5	*x (mm)*	80.44	52.55	29.10	15.30	34.60	41.33	14.10	
	CV (%)	11.43	13.92	9.65	21.36	7.73	16.85	15.75	13.81
Type 6	*x (mm)*	82.50	56.00	29.20	16.20	34.20	42.50	13.10	
	CV (%)	13.48	7.89	11.96	15.98	8.11	22.93	7.82	12.60
Av. CV per feature		11.82	14.64	12.44	17.70	10.98	18.01	16.64	

Variability is also a good factor to distinguish between local/regional products and controlled state products. Arguably, a higher variation corresponds with local/regional production and lower variation with *fabricae* products. This assumption seems promising, confirmed by all types, except for types 5 and 6. If regionality is indeed expressed by variation, we would expect to see higher CV values in these two types. The variation remains low, equal to the values of the state-controlled type 3/4. Clearly, simply connecting variation with regionality as opposed to central production is thus inaccurate. However, it can be argued that although the workshops producing types 5 and 6 in the region west of the Rhine had a regional distribution, they were in fact set up or transformed into official state workshops, after the large *fabricae* in *Pannonia* had ceased production.

8.4.4 Contributions to the style-distribution production model

The evidence gathered from the Low Country crossbow brooch largely confirms the production model put forward by Swift and new information is added to this dynamic narrative. The type 0 brooches (2nd half 3rd century; 'light' crossbow brooches) were

inserted in the existing model, that mainly focussed on the 4th century types. The compositional results place most of these brooches in the leaded bronze group (Figure 161), some very similar, with a high variation in dimension requirements. This makes them very distinct from the 4th century types, which makes an argument for production in local workshops with limited distribution. The findings from the types 1 and 2 brooches largely correspond with the regional character from Swift's model, expressed in the wide range of alloys. Although, for these types the leaded bronze group appears to be equal to the brass/gunmetal group (Figure 161), suggesting a larger amount of brooches originating from the Danubian area or produced in a state controlled environment. The degree of variation also points to regionality, of which the type 1 brooches divert more from the later dimensional requirements than the type 2 brooches. This corresponds with the observations from Swift that the type 2 is very differentiated with some regional subtypes and others already very similar to the highly controlled type 3/4 that dominates the bulk of the 4th century production. The brass/gunmetal component increases to over half of the brooches composition for the type 3/4 brooches from the Low Countries (Figure 161). However, their composition remains very dispersed along the zinc-lead axis. The degree of variation declines strongly towards a standardised appearance and the dimensional requirements have become very strict. All of which is in agreement with a state-run production from one or more central workshops, submitted to a high degree of control. The image for types 5 and 6 reclines to less brass/gunmetal, more leaded bronze and an steep increase in the (unalloyed) copper group, pointing towards a regional production character. In the ternary diagram (Figure 161), we see three groups for these two types, potentially linked to different workshops. More brooches will have to be analysed to confirm this. The degree of control and dimensional requirements remain similar as to type 3/4. This could only indicate a change in resources for the fabricae or a change in the dimensional expression of regionality. A change in symbolism of the crossbow brooches for the late 4th – early 5th century is already mentioned. This contextual change has to be taken into account, implying that these compositional results have to be interpreted from another perspective from the late 4th century onwards (see 8.5). We believe that a regional character for these brooches is correct, but that the concept of a central state-run production can no longer be seen as incompatible with regionality.

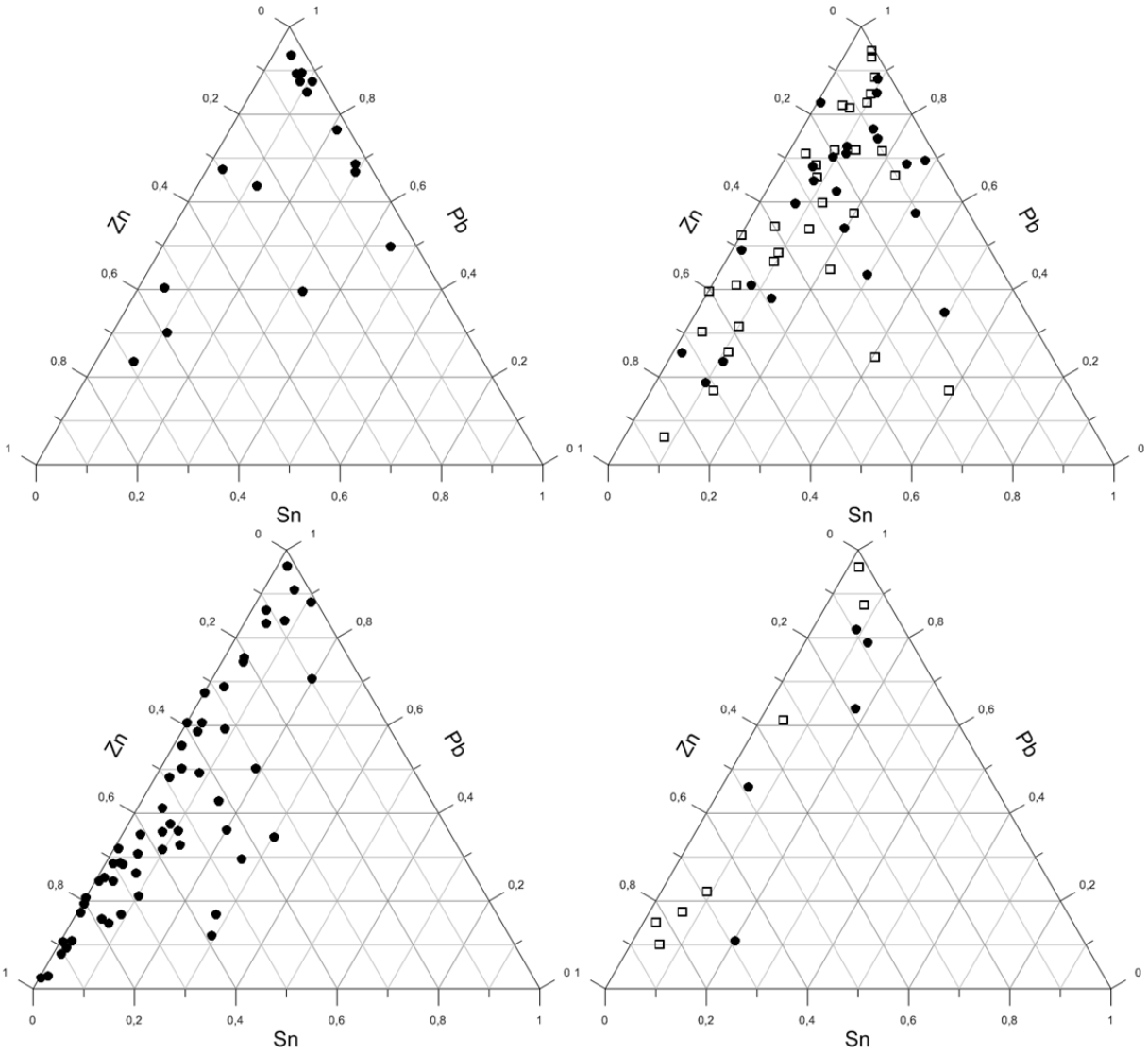


Figure 161 Ternary plot per chronological phase. Phase 1 (top left) consists of type 0; phase 2 (top right) consists of type 1 (circle) and type 2 (square); phase 3 (bottom left) consists of type 3/4; phase 4 (bottom right) consists of type 5 (circle) and type 6 (square).

8.5 Production and consumption of the crossbow brooch in Northern Gaul

To conclude, the major implications from the cultural biography, the stylistic evaluation and the production evidence are combined into a general chronological overview of the production and consumption of the crossbow brooches from northern Gaul (for detailed argumentation and specific examples, we refer to the relevant subchapters).

Not much is known about the origin of the crossbow brooches' life (type 0), other than that archaeological evidence places them predominantly on military frontier sites. Additionally, the lack of iconographical and historical evidence suggests that the owners belonged to a lower social military class. Furthermore, the stylistic evidence points to a high degree of uniformity, compared to the later types. Consequently, these earliest examples demonstrate all the characteristics of a high output craft production: everyday use, low manufacture cost and skill, minimal decoration and randomly discarded due to loss, damage and wear (Caple 2006, chapter 1). This corresponds with the general notion that this artefact emerged from the general class of bow brooches in the second half of the 3rd century for northern Gaul, originating as a soldiers uniform attribute in the Danubian area. Whether this was due to the movement of troops or rather an indirect influence from the military dynamics in this period is yet uncertain. Moreover, the combination of stylistic uniformity and size variation can point to batch productions. Given the localised production nature, indicated by the compositional and dimensional data, this seems likely. In the course of the later 3rd century, this developed into a regional distribution of overall uniform shapes with few stylistic freedoms. The latter can be caused by conformist biases (Eerkens, Lipo 2005) in either the expression of the consumer's military identity or due to differences in craftsmen or workshops.

Along the transition from the 3rd to the 4th century, a first change in the symbolic value of the crossbow brooch occurred (mainly types 1 and 2). These objects show a wide range of shape and style innovations and an increased number of retrieved artefacts. Additionally, the crossbow brooch starts to be depicted in iconographic sources, displaying connections with military and *Pannonian* attributes (Figure 162), enforcing the hypothesis of a Danubian origin. Furthermore, the art-historical evidence uncovers a dual message connected to the crossbow brooch at this point in its life: on the one hand is its association with anonymous members of the military (Figure 103) and on the other hand is its connection to public figures (Figure 102). The distinction is not as clear cut as simply a division between military and civilian, because many high end civilians had military backgrounds or official ties to the military establishment. Moreover, in the 4th century the official civilian dress was highly influenced by the military. As indicated by the luxurious examples bearing inscriptions praising emperors are found from this period. This duality is also visible in the nature of its production. The compositional data for northern Gaul and Britain shows an equal amount of alloys associated with regionality (leaded bronze) as metal linked to official production (brass/gunmetal). Adding the

'unalloyed copper group' to the evidence for regional workshops, the balance tips towards a largely continued regional production with a smaller amount of imports from centralised *fabricae*. The increased amount of variation suggests the persistence of limited control and no fixed requirements, although the decrease in length/width ratio indicates an underlying set of rules. The increase in variation is significant to understand what kind of object the crossbow brooch is at this point in time. As can be interpreted by Kopytoff (1986) statement that it is normal behaviour for a commodity, such as a brooch, to show increased variation as the result of its growing popularity in a monetised and commercialised society.

Figure 162 Sculpture from a funeral monument at Tilva roš (Bor, Serbia), dated ca. 280-320 AD, depicting two anonymous men with crossbow brooches on a military cloak and a Pannonian hat (after Petkovic 2010).

Around the first quarter of the 4th century, however, this development of the crossbow brooch as a commodity was intervened to preserve the military authority associated with the crossbow brooch. The general society was denied access and it became a strict military object with a high degree of uniformity, produced on a large scale in a state-run *fabrica*. This process of singularisation is generally associated with the type 3/4, although the start of a more controlled product already existed in type 2 (Swift's type 2ii), fitting with the duality in the previous developments. Despite the increased amount of brooches, there is no corresponding increase in iconographic evidence. The depictions are few and still associated with anonymous military and *Pannonian* identities, supporting the reclaiming of this brooch for the military establishment.

Resulting from the dual social significance, a second process of singularisation started in the second half of the 4th century (types 5 and 6). For northern Gaul, this final stage is

characterised by a drop in the number of brooches. In the iconographic material, we see the gradual disappearance of the anonymous figures with brooches (Figure 162), replaced by personal (often portable) objects with recognisable officials (Figure 163), such as consuls and members of the senatorial class. All of this is in line with the bespoke nature of the brooches at this point in their life: unique and highly valued hand-crafted objects, commissioned by a select wealthy group of patrons, representing the taste of the elite, demonstrating wealth and social position (Caple 2006). Again, it is too simple to classify this development as a civilian elite take-over. Rather, this evolution signifies the ascendancy of members of the military elite to the highest positions in the administrative and political circles of the Late Roman Empire. The excessive decorative nature attests to this, also visible in the presence of gilding . However, the overall degree of variation and innovation is very low despite this often highly decorative nature. Moreover, it can be argued that the styles present in types 5 and 6 are no more than developments from styles already present in types 2 and 3/4. Indicating that it was not the crossbow brooch itself that changed, but its intended message and the sociocultural context in which it was used: the official nature of the military elite. A symbol of authority that had become synonymous with the military establishment became redefined as a symbol for state authority. This process reflects the vast military influence in the Late Roman society and state organisation. This second singularisation can simultaneously be seen as a response on the brooch's recommodisation to the military body and a claim to their military roots, which is expressed in the standardised dimensional requirements in the local/regional products. This new duality indicates the capacity and skill to make high-end official state products in local/regional workshops by the end of the 4th century.

Figure 163 Detail of the lid of the Projecta Casket, picturing Secundus as a Roman official (courtesy of the British Museum, number 1866, 1229.1 AN493408001).

To grasp the importance of these result for Late Roman northern Gaul, we summarise that, in the 3rd century (types 0 and 1), a military item linked to provincial and military identity was produced in multiple local workshops, made by (low) skilled craftsmen responding on a regional need in the military ranks along the frontier zones at the Rhine, as well as for the fortification(s) at the North Sea coast. Over the course of half a century, this type of brooch and its associated social class had gained enough influence to have become a popular commodity around the turn of the 4th century, creating an ambiguous symbol of social identities (types 1 and 2). The regional workshops began to produce on a larger scale on both military needs as well as social demand, resulting in occasional finds away from the frontier. Together with the major military and administrative reforms under the Tetrarchy, the state reacted on this uncontrolled growth by turning the crossbow brooch into a standardised military object with precise requirements (shape) and certain freedoms (decoration) (type 3/4 and to some extent already in type 2ii). They were produced and exported on a large scale from a state-run *fabrica*, in order to supply military needs and to guarantee uniformity. When this major central workshop ceased production at the end of the 4th century (types 5 and 6), the second singularisation was in its turn a reaction from the military elite class with official functions in the administrative and political circles. The crossbow brooch had become a powerful symbol, making it the perfect choice to turn into an elite object and redefine the brooch as an embodiment of the Roman state. Specifically for members of the provincial elite, i.e. judges, senators, governors and consuls. The few examples present in northern Gaul are limited to the major military, political and administrative centres: Oudenburg, Tongeren and Nijmegen.

These elite objects were commissioned in one of the multiple small official workshops and custom made for their wealthy and influential owners. For northern Gaul, the life history stops here at the beginning of the 5th century, with the withdrawal of the Roman presence from the region. The developments of the crossbow brooch, however, continue on until the 6th century in the remainders of the Roman Empire.

Part 4 Social and cultural changes in Late Roman Northern Gaul

9

Interpretation: Towards a new Late Roman archaeology

This chapter combines the general results and interpretation from all case studies and applies the conceptual framework as outlined in Chapter 2. First, the selected material culture is reviewed for its representative value to investigate the Late Roman society of Northern Gaul. Next is an elaboration on the two main processes that were involved in the transformation of the Late Roman society, i.e. militarisation and migration. Finally, we conclude by revisting the core research area within Northern Gaul consisting of the Low Countries region and apply the insights that were gained in this dissertation to reflect on the nature of occupation at the Lower Rhine frontier and the hinterland between the 3rd and 5th century.

9.1 Material culture as a reflection of identity and society

9.1.1 Representation of Late Roman society in the selected material culture

In order to investigate social and cultural dynamics in the Late Roman period of Northern Gaul, three material culture categories were chosen: handmade pottery, terra nigra foot-vessels and crossbow brooches. These case studies were selected because they represent multiple aspects of the Late Roman society (see Part 1).

The presumed social spread of these types of artefacts has proven to be accurate, ranging from rural communities to military groups and state affiliated layers of society. As for the matter on how representative these artefacts are for the entire Late Roman population, we can consider the number of references in the review of the Flemish archaeological record (Figure 164).

From the total of ca. 40 different sites and an additional ca. 90 different find locations, handmade pottery was reported for 16 sites and 11 find locations. The Late Roman terra nigra foot-vessels are less numerous and were listed for 6 sites and 1 stray find. In addition, crossbow brooches were encountered on 4 sites, albeit in large numbers from the cemeteries of Oudenburg and Tongeren, as well as another 6 finds at separate locations.

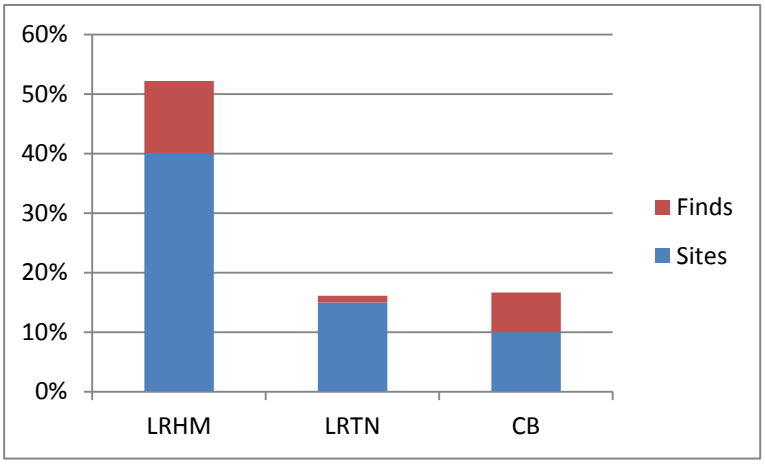


Figure 164 Amount of references in the literature and reports on Late Roman handmade pottery (LRHM, n = 27 locations), Late Roman terra nigra foot-vessels type Chenet 342 (LRTN, n = 7 locations) and crossbow brooches (CB, n = 10 locations), gathered from ca. 40 different sites and ca. 90 different find locations within the test-case region of Flanders.

The validity of using handmade pottery as a representation of a large part of the Late Roman society was already suspected, given the increasing amount of handmade ceramics from the earlier 3rd century onwards. The larger number of sites and finds containing handmade pottery confirms this and, given its identification and dating difficulties, the actual number of sites is likely to be even higher. Furthermore, we can list the lack of handmade pottery from burials, from Tongeren, the focus on Germanic pottery and the necessity of its association in a Late Roman assemblage for identification as additional factors obscuring a clear overview of the actual scale of Late Roman handmade pottery consumption. For example, if the proportions documented for Knesselare (Figure 165) or Lummen – Meldert (Figure 166) are taken as an accurate representation,

we can expect handmade pottery to be an important factor, if not the majority, within the ceramic variation.

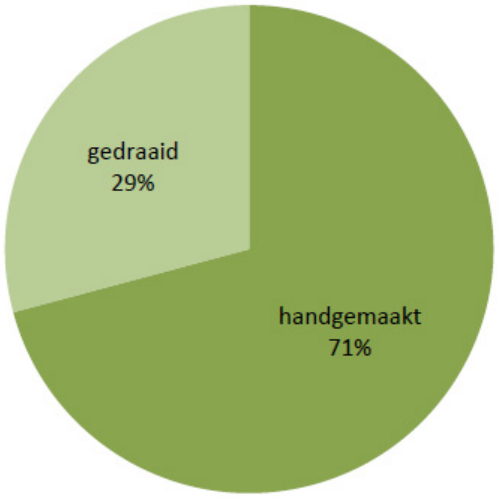


Figure 165 Pottery percentages from the fortification at Knesselare: 29% wheel turned pottery and 71% handmade pottery (from De Clercq, Hoorne, Vanhee 2008, 71, fig. 67).

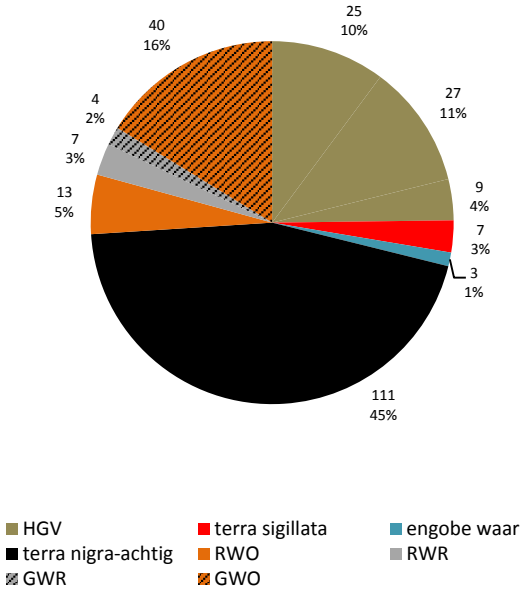


Figure 166 Pottery percentages from the rural settlement at Lummen – Meldert with 25% handmade pottery (from Smeets and Steenhoudt 2012, 61, fig. 7.7).

Not only the large consumption of handmade vessels argues the necessity of its study, but also its connection to the traditional cultural sphere of individuals, families and communities and its place in social practice. From this we have shown that the Late Roman migrations and mobility can be traced by examining the clay composition and assigning provenance areas and origin mechanisms based on geological and technological

information. Consequently, handmade pottery can be seen to represent the rural landscape for both the continued local Gallo-Roman traditions as well as the new non-local Germanic elements that are present from the 3rd to the 5th century.

While handmade pottery is validated by its provenance capacities, large distribution and its major presence in the material record of Late Roman rural sites, the Late Roman terra nigra foot-vessels appear to be quite less numerous in the test area of Flanders. Also, the knowledge on either the production or consumption of these artefacts is quite limited for the Late Roman Empire, only their chronology is accepted to fall mainly within the 3rd to 5th century. Yet, this gap in knowledge made it an ideal topic for research, given that the traditional tools have not yielded valuable explanations for the origin, presence and development of these foot-vessels. By the compiled evidence, it has become clear that not only was this type of pottery a common object in Late Roman Northern Gaul, it also represented an aspect of the social and cultural transformations by which Northern Gaul distinguished itself from the rest of the Roman Empire.

Similar to the arguments concerning Late Roman terra nigra foot-vessels as good representatives for the society of Late Roman Northern Gaul by their chronology and sociocultural development, the crossbow brooches are considered valuable for studying changes in social and cultural factors. They represent a development from military attribute to a symbol of Roman power from the 3rd to the 6th century, albeit that they are only present until the late 5th century in Northern Gaul. In contrast to the handmade and the Late Roman terra nigra pottery, the main relevant social classes comprise of the military and elites in Northern Gaul. While the hinterland is mainly rural, the frontier zone itself is highly militarised and the few urban or economic centres are tied to the administrative body of the Roman state, which would have been frequented by or have housed Roman officials.

In all, these three case studies have provided us with different aspects of the Late Roman society in Northern Gaul that covers the majority of the social and cultural backgrounds of the frontier zone and its hinterland. In no way is this study meant as an overall explaining model, given that much more material culture and additional archaeological and historical models need to be studied before a complete overview of the Late Roman period becomes possible. Nevertheless, the considerations of these three material cultures from production to consumption, combined with the detailed test-case for the region of Flanders, provides us with an additional step towards understanding the changes that occurred between the 3rd and 5th century in the most northern continental

part of the Roman Empire. In the following sections we will consider the nature of Late Roman identities and the largest implications of each case study for the social and cultural dynamics in this period in order to create a contributing interpretation combining all elements from this study.

9.1.2 Late Roman identities

It has become apparent that traditional tools do not suffice to label and study the sociocultural dynamics of the Late Roman period in Northern Gaul. The traditional consideration of the Roman Empire or one of its provinces as a homogenous society creates binary schemes that oversimplify the complexity of changing repertoires in changing societies (Theuws 2009): civilian vs. military, Roman vs. Germanic, Roman vs. Christian. All of these fail to grasp the reality of the multifaceted character of identity which is heterogenic, dynamic and relative to context by nature (Collins 2008; De Clercq 2009). Although, rather than to comment on the impracticality of identity in archaeology or critique the uselessness of dichotomies, it can be argued that the relation between identity and material culture can be used to study changes in society if the focus lies on aspects of expression in 'structured ways of doing' (Bourdieu 1977).

First, an expression of cultural identity closely related to the habitus of the rural societies was proposed for the technique of handmade pottery production. Although some of these expressions are new, the underlying concept has much in common with earlier processes that occurred in Northern Gaul. Beacuse pottery acquisition has been part of the social competition since the integration of the Iron Age tribes in the Roman Empire (Willis 1996), this notion of expression of identity was used for the study of the Early Roman handmade pottery by De Clercq (2009). He noted that when embedded traditions were put under pressure they became explicitly expressed by removing them from their subconscious position in the habitus and redefine them (De Clercq 2009, 462-463). This would result in the development of new styles and constructs or the reinvention of existing aspects of social use of material culture. Although this concept of pottery styles as a proxy for social or cultural traditions usually is understood as the form and decoration of a pot (Renfrew 1977, 4), it can also be applied to fabrics, because they are an expression of the 'style of action' that represents the choices made in the production which reflect social action and cultural concepts (Dietler and Herbich 1998, 236-237).

Second, the consumption of the foot-vessel has been considered as an expression of a merged sociocultural identity on a regional scale. Peacock (1977, 24) stated that an intimate relation between an ancient economy and its social history exists and can be traced through pottery. The reconstruction of the production, consumption and distribution of the Late Roman terra nigra foot-vessels indicated that these objects were rather valued for their worth than for their explicit form or provenance, arguing that despite their typological differences they were considered identical in the perception of the contemporaries (Theuws 2009, 292 after Kopytoff 1986). Additionally, De Clercq commented on the presence of imported Rhineland cups and handmade imitations in the local communities of Menapiorum as a redefinition of new material culture for traditional use and social rites connected to collective drinking and groups identity (De Clercq 2009, 457-458). The same principle applies for the Late Roman foot-vessels with both imports and imitations present in different parts of Northern Gaul, suggesting that the aspect of drinking had remained an important rite and that by the late 4th century the foot-vessels had become the preferred object of choice to perform this social function.

And third, an expression of personal social status and group identity was demonstrated by means of the crossbow brooch. This dress accessory was mainly present in the frontier, which is a multicultural zone in which a number of communities interfaced with each other (Collins 2008, 46), creating an environment in which it was necessary to demarcate higher status soldiers and officials by wearing markers of authority as legitimation by the Roman state (Swift 2000, 9). This kind of object with a symbolic and social value is used to signal membership to a particular group (Swift 2009, 10 after Bourdieu 1984). Given that the crossbow brooch was a military marker and a military status was desirable by others, it became ambiguous as a social identifier for a group identity, but remained very informative for the social status of an individual.

Additionally, we also briefly touched upon other mechanisms that are related to other social processes, such as the burial rite, with the persistence of cremation as a local construct and the introduction of the 'weapon' graves as a way to give meaning to new identities (Theuws 2009). Similarily, the settlements and house construction techniques are strong indicators of local or non-local tradition, such as the three-aisled byre houses and sunken huts (for a discussion on the relation between these houses and migration, see Heeren 2016). And finally, the choice of location for the new Germanic settlements on or in the direct vicinity of earlier Roman settlements can be construed as a claim on the Roman landscape (see Chapter 4).

These expressions in material culture indicate change and hybridisation as forms of the transformation of social systems, which was caused by the merging of identities. This did not occur overnight, but over the span of several generations and accumulated in the later 4th century in a general drinking tradition, the copying of local traditions by new settlers, as well as the use of new tempering agents for the manufacture of traditional pottery, and the adoption of military styles in civilian and state affairs. We can thus conclude that material culture can be used in relation to social and cultural dynamics, given the correct consideration of context, scope and scale. For instance, traditional pottery techniques are appropriate to investigate cultural identity in rural communities and not for establishing social status. Likewise, the military insignia can be used to examine social identity in a stratified community but not to establish a cultural or ethnic origin of the individual. In order to demonstrate this connection between material culture and identity and its reflection of larger changes in society, we will elaborate on the relation between change and expression of identity for each case study.

9.1.3 Late Roman Handmade pottery

First, the chapter on handmade pottery has revealed much new information with which to evaluate the Late Roman multi-layered society in Northern Gaul. Conclusions were drawn in respect to the production process by local Gallo-Roman traditions, non-local traditions of Germanic communities and innovations caused by the movement and interaction between these groups (Figure 167). The focus mainly resided on production by investigating matters of provenance and technology to answer questions on the cultural background of the people creating or moving handmade vessels.

From the petrographic results, the distribution pattern and chronological assessment, it was first deduced that the local Gallo-Roman tradition of manufacturing handmade pottery related to a composition of sedimentary clays, mainly tempered with grog and occasionally with plant matter or without a tempering agent. These fabrics are found abundantly in the entire research area corresponding with Flanders and the southern Netherlands as well as in northern France and the northern Netherlands. The grog-tempered wares also are documented for the southeast of Britain (Gerrard 2013) and are considered to be related to social and cultural constructs of local identities (cf. De Clercq 2009). This is reinforced by their mainly localised production with a small source-to-site distance.

Second, the non-local fabrics were assigned by identifying various clay sources that could be traced to the glacial areas of northern Netherlands and Germany (plutonic and metamorphic class), the Eifel region (volcanic class) and the alluvial clays of rivers that originated in a divers geological landscape (metamorphic and sedimentary-metamorphic class). These fabrics that are 'exotic' to the research area were mainly untempered, not counting the rock fragments that were most likely embedded in the clay source. The assignment of a single Germanic identity to these different non-local handmade ceramics has been proven to be over-simplified. The plutonic sources can be related to Germanic communities north of the Rhine, while the metamorphic sources can be more divers, especially in combination with the sedimentary detritus indicating alluvial clays, meaning the metamorphic material could have been transported over an unknown distance. Additionally, the volcanic inclusions appear in pottery with a possible earlier starting chronology, as well as indicate a provenance to the southeast rather than the north. It is uncertain whether the source area has to be sought within the Roman borders between Trier and Cologne, or at the other side of the Rhine. Either way, their origin is located in a highly active zone with economic, military (Roman and Germanic) and imperial activities during the Late Roman period.

Third, a number of innovative fabrics were discovered, i.e. new tempering agents in local clays that do not appear to have been present before the Late Roman period or have spread beyond the Lower Rhine frontier and its direct hinterland to the south. The untraditional elements comprise of bone, shell and slag tempers. The distribution of the bone-tempered samples clusters along the Lower Rhine region, suggesting a possible origin in the frontier zone. In comparison, the shell-fabrics have a wider distribution in the research area. The coastal sediments have been suggested as possible clay sources, although also fresh shell material has been encountered in the thin sections in addition to fossilised shells. The slag temper is limited to only two samples and did not reveal any indication towards its origin. These new elements can be interpreted as innovations that emerged from searching new ways to express identity and redefine social constructs. This can either be a local innovation from the traditional techniques as the result of internal or external causes, or the result of interaction on the part of the Germanic immigrants. For the latter, two considerations were proposed. The first is a functional motive by which the new settlers tried to manufacture pots in their tradition in the new environment where only fine clays were present, which were unsuited for their design, use and technique. From investigating the traditional Germanic fabrics, it has become clear that

they had a much more limited application for temper-adding, given that their clay sources were often naturally tempered by rocks and thus coarse in nature. As a result, the Germanic communities had to adopt the act of intentional tempering. The second motive relates to social acculturation and assimilation by which an active interaction resulted in the adoption of the local tempering traditions, as well as experimentation with new tempers to distinguish themselves from the 'others', i.e. people from a Germanic descent to people from a Gallo-Roman background.

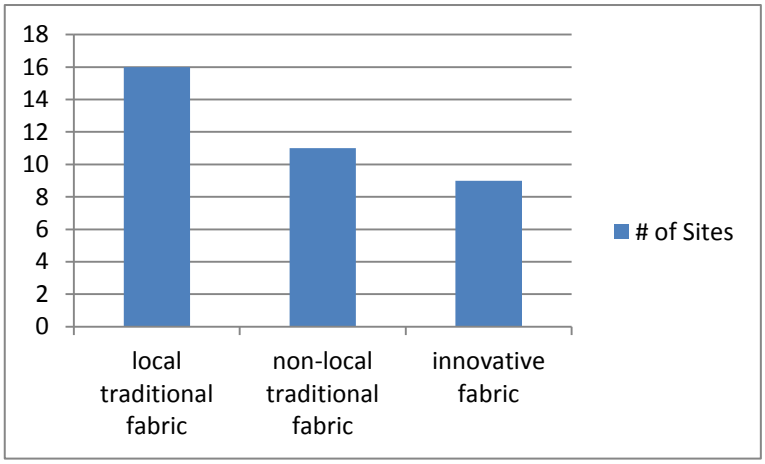


Figure 167 Total number of samples sites (n=19) on which fabrics associated with traditional local, non-local or innovative pottery have been found by means of ceramic petrography within the study area.

In addition to the focus on production and origin, it is also necessary to consider patterns of consumption in relation to social and cultural dynamics resulting from the mid- to Late Roman continuity, the mobility and migrations and the following interactions. To do so, a detailed knowledge of the associated context is required. To see if this method can be applied on fabrics, rather than style based on shape and decoration, to gain insights in the sociocultural nature of settlements, a brief exercise is undertaken using sites from the test case of the Flemish region (Figure 167 and 168). Sherds were collected from: the rural Gallo-Roman settlement of Turnhout (TUR); the fortification of Knesselare (KNE); the military fort of Oudenburg (OUD); the rural settlements with confirmed Germanic elements of Neerharen-Rekem (LNR), Sint-Martens-Latem (SML), Lummen-Merldert (LUM), Hasselt (HAS) and Nazareth (NAZ); and the contexts containing Germanic pottery from Zele (ZEL) and Morstel (MOR).

On all of these sites the local fabrics were encountered and - except for Knesselare and Turnhout - non-local fabrics are also present on every site. In contrast, only four sites yielded ceramics with innovative fabrics. On a first level, it is clear that some sort of

connection can be seen between local communities and the area's north of the Rhine and the Eifel region. This could indicate trade or exchange, although this is less likely in the case of traditional handmade pottery, which remains closely associated to the habitus and has little external social value to be adopted for prestige. With the necessary caution, we argue that this image supports the presence of immigrants represented by non-local fabrics. A migration or mobility model fits the data, reinforced by the appearance of the innovative fabrics that do not appear to have any parallel in Northern Gaul or beyond the Roman frontier, before appearing in the 3rd and 4th centuries. The latter would not be explained be an exchange mechanism of pottery, given that this would assume a consumer market that needs handmade pottery from somewhere else, while they were abundantly made locally. Moreover, the traditional value of handmade pottery does not necessarily lie in its consumption, but rather in the production technique and process, which would have been a proxy for kinship or membership of a community. If exotic handmade pottery was obtained by trade or exchange, most likely the use of these vessels would be redefined to suit the local traditional constructs and use, and would not result in the creation of new styles of pottery manufacture in either production or consumption location.

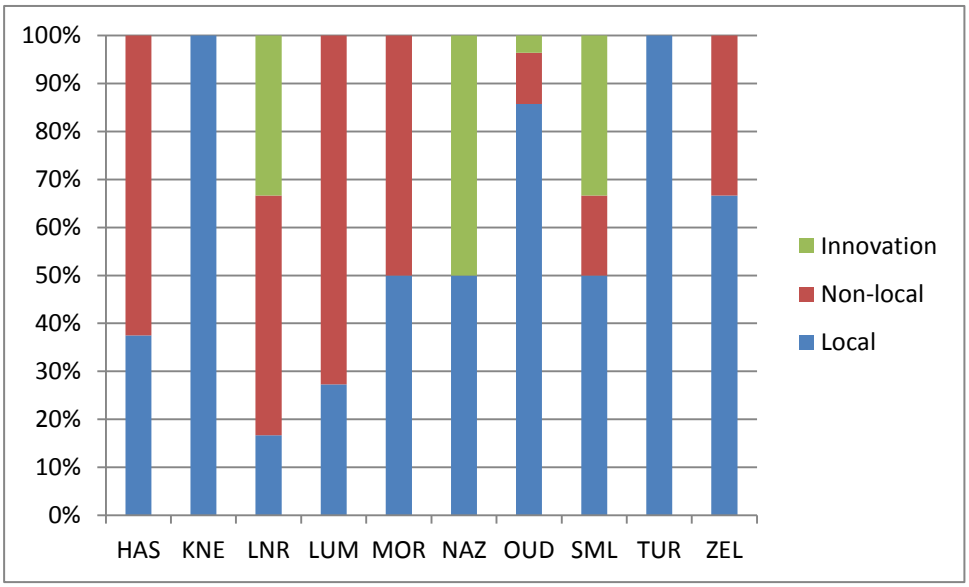


Figure 168 Percentages of local, non-local and innovative fabrics on sites from the Flemish test-case area. Total number of samples = 76; per site: HAS = 8, KNE = 5, LNR = 6; LUM = 11; MOR = 2; NAZ = 2; OUD = 28; SML = 6; TUR = 5; ZEL = 3.

To explore this matter of expression by production technique further, the focus is put on the tempering agents to discern patterns. From this, it becomes clear that the grog-tempered ware was found not only in local contexts, but also in association with Germanic

contexts, such as the settlements of Lummen, Sint-Martens-Latem, Hasselt and Nazareth. Either this type of temper was quickly adopted by Germanic potters or the exchange of local handmade pottery took place at the interactions or interfacing between the new settlers and the remaining Gallo-Roman communities.

In some cases, arguments could be made for a mixed community, increasing the level of interaction and creating the need to experiment with new ways of expressing identity, such as the use of different tempering agents. A good candidate for this scenario is the site of Sint-Martens-Latem. The local sedimentary class and to a lesser extent the plutonic class are present in the handmade pottery of this site and is tempered with grog, bone, plant and slag. This is the largest variety that has been encountered in the test-case area, where most sites revealed only one or two tempering agents. Sint-Martens-Latem is also located in the most active region of the Lys-Scheldt region, with good connectivity to a potential local or regional network via the rivers and roads. Known sites from the region that argue a continued local occupation are Kruishoutem, Nazareth, Kortrijk and possibly also Gent. Additionally, Germanic elements in the near vicinity have been found at Asper, Kruishoutem, Nazareth and the recently excavated site of Bachte-Maria-Leerne can also be added to this list. The economic activity and potential military traffic (see 4.4.3) would have resulted in interaction on a daily level. This is a well suited environment in which the need to distinguish between indigenous and foreign traditions would have been created, which could have been expressed by the use of different tempering agents.

More evidence of interaction or interfacing between different groups can be seen in the variety of different geological source areas that are present on the same site. Mainly the sampled sites contained only one or two geological classes in their handmade pottery, but Lummen, Hasselt and Oudenburg display four. For Oudenburg, a cultural interaction on a considerable scale is assumed by the evidence from the burial site that points that the fort was concurrently housing Roman soldiers/officers from a wide variety of backgrounds, both Germanic and Roman in origin. The abundant presence of grog-tempering in the handmade pottery found in the excavation of the *castellum* indicates that pots were mainly made in a continued Gallo-Roman fashion, suggesting that local elements were actively involved with the daily life at the Roman fort. The sites of Lummen and Hasselt on the other hand form a small cluster with Donk at the wider periphery of Tongeren. Although these three settlements yielded much indications towards a Germanic community, a Roman element cannot be denied, and perhaps even Germanic groups of different origins were present at the same time in that region. For instance,

Germanic communities originating from the north of the Rhine can be assumed for Hasselt by the identification of a plutonic class handmade pot. A larger amount of metamorphic class handmade ceramics has been found in both Hasselt and Lummen, as well as the sedimentary/metamorphic class. Additionally, these have been attested for Donk as well. The sherds from a metamorphic source could have originated at the same location as the plutonic, although other areas cannot be ruled out, such as possible alluvial clay outcrops along the Rhine. Definitely from a different source area are the volcanic class handmade pots also found on all three settlements. It remains uncertain if this would indicate a second or third Germanic group, or if this indicates an exchange/trade network. In addition to all this, the local sedimentary class sherds with grog tempering are encountered on all three sites as well, i.e. markers of Gallo-Roman tradition. This is not very surprising, given their vicinity to Tongeren and its continued urban and rural society.

Overall, it is clear from the handmade pottery that communities and groups with different cultural and social backgrounds interacted with each other and were possibly part of a local and/or regional network, either connected by the rivers in the Scheldt basin, or by the many roads leading through this part of Northern Gaul. This interaction would have resulted in trade and exchange, but also in the adoption of local or exotic traits, either by technical necessity or as a social mechanism of assimilation. On the other hand, this interaction of traditions would also have resulted in the expression of identity and distinguishing the own group and community from the 'other'. This mechanism is a socially embedded construct and could have occurred in both the indigenous and the migrants cultural spheres.

9.1.4 Late Roman Terra Nigra

The aspect of interaction is more present in the second material culture case study on the Late Roman terra nigra foot-vessels. In Chapter 7, we focussed on the best documented types of foot-vessels: type Chenet 342 and Gellep 273/274. Beside these types of bowls and cups on a (high) foot, other types with similar S-shaped profiles occurred as well. Additionally, a good part of these foot-vessels were wheel-turned, but also many handmade variations are known. Alongside this selection of foot-vessels, more vessels and fabrics can be ascribed to this general and large group. It can be argued that all of

these vessels can be accumulated to represent one characteristic aspect of the Late Roman society of Northern Gaul, i.e. the importance of drinking as the central social rite.

As discussed in the chapter, the Late Roman terra nigra foot-vessels can be seen as a product of interaction and even co-habitation in the frontier zone of the Lower Rhine area and the rural hinterland. In this frontier zone, members of the military establishment and local communities from both Roman and Germanic sides of the Rhine would have interacted on a semi-daily basis, already from earlier on in the Roman period. In the Late Roman period, the number of individuals and groups from Germanic descend had increased in the military (Halsall 2007) and took the scale of interaction beyond economic and military encounters to actual co-existing for longer periods of time and working together in varying degrees of intensity. This interaction could have been positive, such as economic relations, or negative, such as armed conflicts, which would have undoubtedly adjusted their attitude towards each other. Over time it can be assumed that customs and habits would have been exchanged between groups of different cultural backgrounds, e.g. local Gallo-Roman or Germanic communities, soldiers from Gaul or other parts of the Empire such as Britannia or Pannonia, merchants from Southern Gaul or the Mediterranean. It is clear that a frontier zone with a standing army (*limitanei*) is a very complex and highly interactive region, which would have constructed their own social and cultural identity towards the surrounding areas, either self-created or assigned. This constructed group identity developed over the span of several generations and would have been highly influenced by its multicultural society and regular contact resulting in a merged or hybrid nature.

The examined foot-vessels are an excellent example of this. In search for its origin and production, evidence was found for at least two major productions located on opposite sides of the established Roman border in the frontier zone or its direct vicinity. From the combination of fabric, form and composition, one large-scale production can be sought in the Hellweg area of Westphalia, another in the Dutch-Belgian area. Furthermore, it was established that production took place on different scales from organised high-output workshops to low skilled household manufacture. This indicates that not only was there a large consumer market available, the foot-vessels itself held some social significance making them desirable even when no access to the larger productions was possible. The accepted wide variety in technique, form and size supports this notion.

It became clear that the answers regarding the origin, development and success of the foot-vessels would not be revealed by its production at this point in research, but more

likely resided in its consumption. First, the variety in size, production quality, decoration and finish indicate that it was not meant for a specific application, but rather for a general varying use. Additionally, the foot-vessels are most often classified as cups, bowls and beakers and appear to be a rather general shape for a drinking vessel. Second, exploring patterns in the deposition context or the nature of sites on which these pots were found, did not deliver any conclusive explanation. They are found in both settlement and burial contexts, fragmented in a ditch or complete in a burial or a well, ranging from rural to military and urban sites. This apparent lack in pattern is explanatory on itself and suggests a wide use in all layers of society, which in its turn suggests a common activity for its use. Third, the distribution shows that the largest consumption market was located in the Lower Rhine frontier in the north and east of our study area. An additional dispersed pattern leads away from the frontier zone to the south and the north. All these elements add up to a development in the frontier zone with a wide application in all communities.

Whether it was a Germanic or a Roman vessel has widely debated, although Chenet (1941) already called it a Germanic idea in a Roman body. This basic reference to the merging of two cultural backgrounds in one product captures the essence of the nature of the Late Roman terra nigra foot-vessels. Its origin is most likely inspired by Germanic design and customs (Figure 169), given that the basic S-shaped vessels are already present in the 2nd and 3rd century, whereas they had disappeared from the Gallo-Roman spectrum. The inability to place these ceramics in an accurate Roman or Germanic tradition is the result of the hybridisation process that created them. The Germanic form and tradition might have been the initial design, but the frontier zone dynamics and interaction resulted in the application of Roman techniques to produce these pots for the social demand of both local Germanic and Gallo-Roman communities. The military was probably also a large, if not the main, factor in this development, given that the Late Roman military is known to have adopted the 'barbarian styles' and this frontier zone was occupied by both. It is not unimaginable that they copied or exchanged social customs and after one or two generations had created a tradition that was neither completely Germanic, nor Roman.

This hypothesis would explain the clustering in the frontier zone, but not the distribution away from the Rhine, in both directions. The Roman frontier zone can be considered an active area with a constant influx of people and goods, but it can also be seen as a region from which many people departed: e.g. soldiers that were stationed

elsewhere, relocated or retire, merchants returning from delivering or trading goods, people moving to the hinterland looking for arable lands or opportunities, and so on. The frontier zone is not merely an end zone, it is also a departure zone, from which people leave with a 'frontier identity' or with a notion of the hybrid customs that live there. Especially people who have lived in this frontier region and carry the developed merged tradition or identity, would have tried and upheld their traditions and association with the 'frontier culture'. This would have caused the foot-vessels to move away from the frontier zone.

In addition to this, we also have to consider the civilian adoption of military styles, and assumedly social expressions, which were already influenced by Germanic styles and customs. Furthermore, the Germanic migrants and descendants living in the rural countryside are also very likely to have upheld the original or the hybrid tradition, and would have interacted with local Gallo-Roman communities and possibly had access to local and (inter)regional Roman networks. This movement away from the frontier and merging of identities could have created a need for the production of foot-vessels in areas away from the frontier zone. For the Roman areas, it is possible that existing production centres picked up on this need or demand and started to produce the foot-vessel form in their own fabrics and idea of what such a pot should look like. This would provide an explanation for the dispersed nature of the ceramics, as well as the variety in fabrics and confusion on their origin. For instance, besides the two major productions, it is also likely that the Argonne workshop produced foot-vessels or other production centres remaining in the areas of Northern Gaul.

A final step in the social and cultural significance of the Late Roman terra nigra foot-vessels is to consider them as a regional product characteristic for Late Roman northern Gaul. If indeed they were meant for drinking, it can be assumed that these vessels played a role in social events which involved drinking, such as social rites, celebrations and festivities in general. Also, if indeed they originated as a hybrid product from the merging of Roman and Germanic identities and communities in the frontier zone, it would stand out in contrast to other regions with a more traditional Roman culture, such as for instance Southern Gaul and the Italian peninsula. Social interaction and festivities are evidently also of major importance in classical Roman tradition, although the main expression of social competition was communicated through the display of food in the Late Roman period (Dunbabin 2003, 162). This increased focus on the drinking aspect as the main social construct in public or shared experiences would have distinguished

Northern Gaul from its neighbouring provinces and the lifestyle at Rome at this time. Consequently, the foot-vessels can have actively contributed to creating and upholding a regional identity on a military and civilian level of what was only one aspect in the changing mentalities of Northern Gaul in the 4th and 5th century.

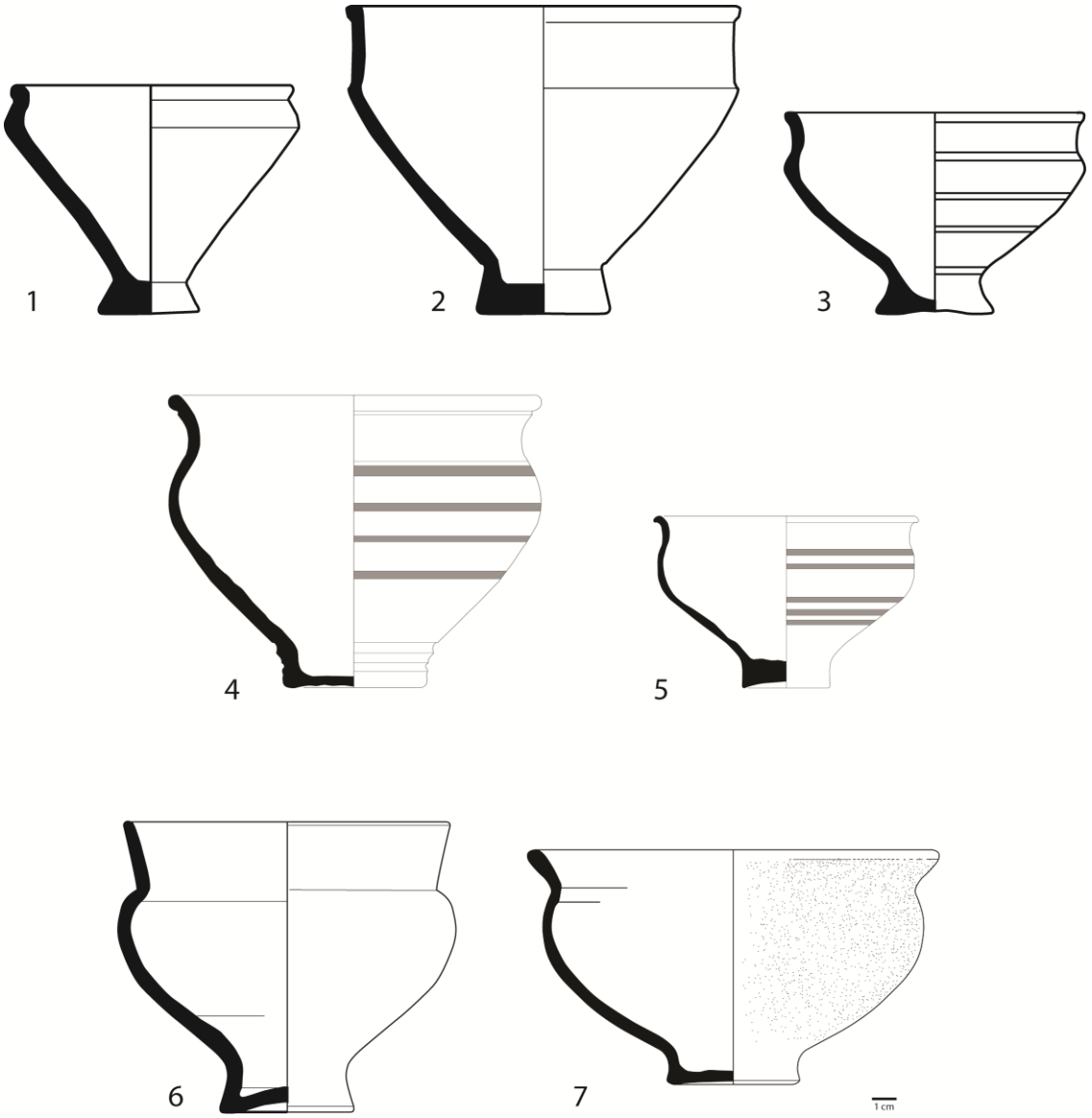


Figure 169 Selection of S-shaped foot-vessels. Germanic types: 1.Uslar I; 2. Uslar II; 3. Wijster 1D; 4. Gellep 273; 5. Gellep 274. Roman types: 6. Chenet 342a; 7. Chenet 342b (1-3 after Taayke 1999, 198, fig. 2; 4-5 by C. Agricola; 6-7 by J. Angenon).

9.1.5 Crossbow brooches

Another object type that reflects regionality and is closely related to identity expression, is the crossbow brooch. In the chapter the social and historical contextual transformation

were considered, as well as the variation and uniformity in style and composition related to differences in production and changes in the social symbolic value.

The contextual changes from the origin of the crossbow brooch in the 3rd century to the end of its life cycle in the 6th century, revealed a complex and non-linear development through social ranks. It originated in the 3rd century as a military accessory mostly found in the frontier zones as a high output craft product, indicating a low social standing for its owners in the military ranks. Its potential Danubian origin might point to the presence of soldiers from Pannonia, Raetia or Illyricum in Northern Gaul in the 2nd half of the 3rd century. Possibly related to military interventions against incursions, separatist regimes or pretenders. Another explanation consists of influence by other Roman military tastes or military trends adopted by soldiers in Gaul. In this case, the distribution of crossbow brooches in Northern Gaul could have been the result from a consumers need or demand. Alternatively, it can resemble the provision controlled by the producers. In a military market, the options are likely to be more limited, given that decisions regarding the clothing, i.e. uniform, is likely to be regulated and determined by others than the actual owner. Choices could have been limited by the workshops or commanding officers or the state. In any case, this conformist bias would explain the limited variety of shapes, styles and decorations. The local productions and limited distribution argue for a local or regional decision, either by the military, the producers or the owners.

Towards the late 3rd century, this brooch type became closely associated with the general military garb and style, much like the belt buckles and chlamys cloak. And in the early 4th century the crossbow brooch became adopted by civilians in order to imitate the military style. The military style had become a matter of prestige, as a consequence of strong imperial politics from emperors with military backgrounds and the high influence resulting from the frequent interaction in the everyday life during the '3rd century crisis'. This shift towards an item of prestige caused a duality in its social value: on the one hand it was a military symbol and on the other hand it was a civilian claim of the military power. Although it remains possible that the latter had actively served in the Roman military. Additionally, the highly decorated and inscribed examples indicate that only individuals with sufficient financial capacity could have afforded such an imitation of military identity or were allowed to wear it.

In the beginning of the 4th century these imitations had become very varied in shape and style, to which the military responded with a high degree of control and uniformity. The production took place in a limited number of state controlled workshops or *fabricae*

and certain 'rules' were applied to its design, in order to maintain its function as a recognisable symbol. Liberties in decoration were allowed, but represented more likely expressions of identity tied to a military unit rather than a geographical origin of the owner. If, again, the range of possibilities was not merely determined by the producing workshop(s).

As we can see from the illustrative sources, the civilian ownership had not ended during the 4th century. On the contrary, by the end of the 4th century, it had developed into an attribute worn by public officials and aristocratic elites. These highly decorated crossbow brooches had become symbols of power, not only for the military, but also for state government. These were closely connected and as such facilitated the transition for the crossbow brooch from a military item to a state insignia worn by consuls, judges and senators. Important to note is that no evidence indicates that it has ever been worn by a member of the imperial family. By the end of the 4th century and the early 5th century, the large state-run production centre had ceased providing supplies to military units, resulting in the exclusive use of this brooch type for state officials in the 5th century. For the Western Roman Empire, this phase was brief, given the disappearance of official Roman troops and government in the first quarter of the 5th century. Nevertheless, it remained a Roman symbol of power in the region of Northern Gaul, as can be seen from the funerary garb of Childeric.

When these different identities expressed over time by the crossbow brooch are plotted for Northern Gaul (Figure 170), we can obtain a sense of the changes in the zones with military and state presence. The general presence of crossbow brooches corresponds to the three bordering military zones of the research area: the coastal plain (Oudenburg), the road Bavay – Cologne (Tongeren and perhaps Tienen as a secondary road) and the Rhine limes (Nijmegen, Wijk-bij-Duurstede,, Beuningen, Ravenstein, Maasdriel, Beneden Leeuwen, Alphen aan de Rijn, Den Haag). The few dispersed finds in the hinterland can represent military traffic, activities leading to loss or retired military veterans. For the 3rd century, we can confirm the presence of troops, possibly with ties to the Danubian regions, on all three these zones (light blue). The early types of crossbow brooches are encountered on almost all sites and the actual number of objects can be expected to be much higher than represented here, given that they were not yet part of the burial rite and they were recycled when they were broken or no longer needed. Additionally, the 4th century military (dark blue) continues in all three military zones, but the connection with the Danubian region has become less likely in the form of troops and more likely in the

form of supplies, tied to the crossbow brooch provision by the state controlled workshop(s). Besides the military occupation of these sites, some civilian imitations (yellow) and possible early military-civilian crossovers (green) can be seen as well. For Oudenburg this is unexpected, because a strictly military occupation is assumed. For Gent, this can be seen to support the notion of the presence of a fort, but is rather a result from the military traffic in the area. Concerning Tongeren, it is more expected due to a civilian or urban population and influence of the units stationed in or around the town. In a mixed social environment, such as a town or a civilian settlement in the frontier zone, i.e. Nijmegen and Wijk-bij-Duurstede, it is more important to display status and identity and more prestige could be gained from adopting military styles. Finally, the state officials and high military officers (red) can be located at Oudenburg, Tongeren and Nijmegen (including Ravenstein), the focal points of the military organisation and urban centre in this part of Northern Gaul.

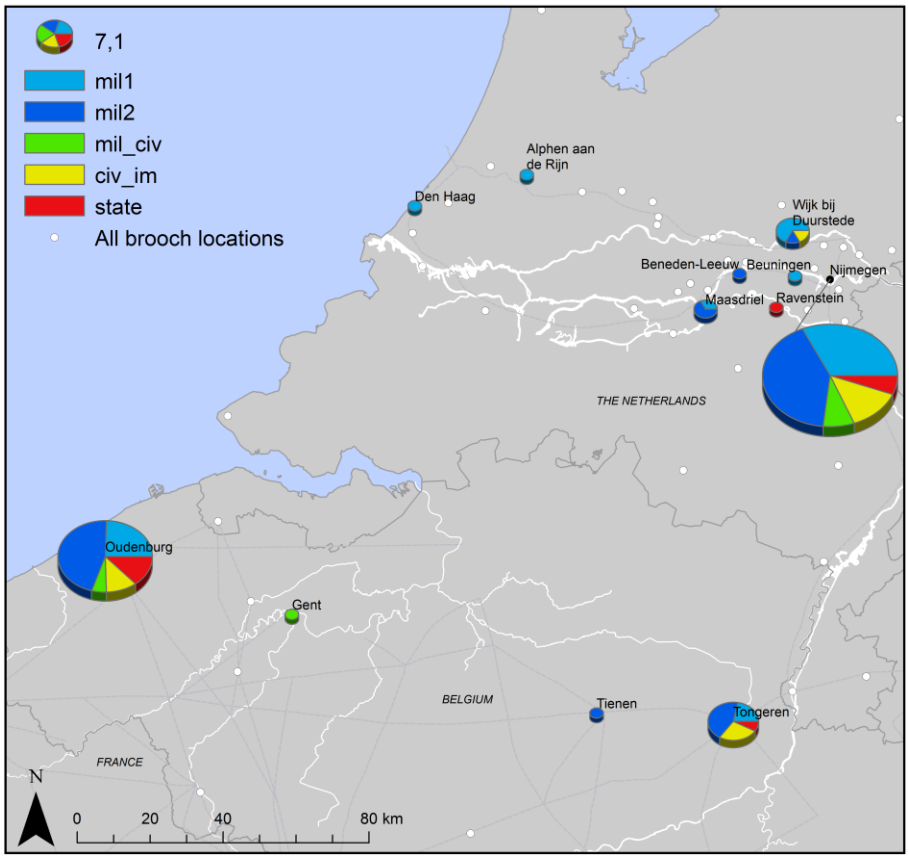


Figure 170 Distribution of social identity derived from applying the sociocultural biography on the analysed brooches (n = 179).

The crossbow brooch is an important item that reflected the identity of its owner in a very active manner. It was displayed on the shoulder, intended to be seen by others and conveying a social message. Arguably, the first presence of this brooch in our region

expressed not only a military identity, but also an origin to the Danubian provinces. It was widely distributed in the research area, indicating that the entire population would have been familiar with it to some extent, depending on the scale and frequency of the interaction with the military. The 4th century becomes again more complex when considering the expression of identity. The bulk of this brooch was still worn by members of the military, provisioned by *fabricae*, although also non- or ex-members displayed this military association. Often in a more decorated and precious manner, communicating their social resources and/or network. Even more so for the inscribed examples, additionally implying an affiliation with the state and the emperor. Furthermore, the presence of these civilian imitations indicate an environment in which social prestige could be gained by displaying such social status, i.e. places where elites would interact with each other. When this process of displaying military insignia by the elite increased in the later 4th century and became the norm for state officials and public figures, we also see an increase in regionality. The brooches, which not provided by the large *fabricae* to the general military body, were produced in Northern Gaul and have a more limited distribution. This indicates that not only did the elite crossbow brooch communicated position, status and wealth, it also referred to the region of origin either of the owner, the gift-giver or the place of office.

This is again an example of the process of merging identities in Late Roman Northern Gaul. This time when the presence and interaction with the military results in the civilians adopt military symbols for prestige. And despite the influx of standardised and uniform brooches for the military, it developed into a symbol of power that contained information on the regionality, expressing an origin or loyalty to Northern Gaul.

9.2 Social and cultural dynamics in Late Roman Northern Gaul

9.2.1 The process of militarisation

The military was very present in Northern Gaul from the 3rd century on. Within the research area, which is the most northern part of Gaul, three military zones are present

in the Late Roman period: the Rhine frontier, the Litus Saxonicum at the North Sea and the eastern part of the road Bavay-Cologne. For our research area, the Rhine frontier is the most active zone. The term of 'military zone' is used here in following Böhme (1974) and Whittaker (1994) in their consideration of a border or frontier as a zone of interaction, in which, in this case, the army would have resided alongside groups and communities on both sides of the Rhine.

The process of the impact and influence that a standing army had on the local communities is referred to as 'militarisation'. Esmonde Cleary (2013, 42) states that the militarisation of the Roman Empire was a process that had started in Northern-Gaul and the Rhineland in the later 3rd and 4th century, which became a general phenomenon for the 5th century Western Empire. With this he referred to '*the growing importance of military-style identity and self-representation'* (Esmonde Cleary 2013, 42) and not merely the increase in military installations or changes in military organisation. He claimed that the response to the military instability in the 3rd and 4th century had caused a change in the army and the attitude of the aristocracy in the region towards the military, consequently leading to expressions of military power by the Late Roman state and army and those who used this as an opportunity to gain power:

> '... one can argue that the army became more central to civil life in the frontier provinces and for the elite increasingly a source of power, authority and advancement' (Esmonde Cleary 2013, 43).

This argument points out that also without military installations or residing troops in the vicinity, an area, town or settlement can be considered 'militarised' when they put significance in the expression of military styles as part of their own identity or in their pursuit of prestige and social competition.

For the Rhine frontier, the presence of military installations along the Rhine and Meuse also meant the presence of troops, military personnel, administrative centres, and active local and interregional supply lines. All of which were part of the daily life of the local rural and urban communities in the military zones and its direct hinterland. This undoubtedly had an impact on the identity of military and military-related individuals (Gardner 2007), but also on people who never served in the army (Esmonde Cleary 2013). For the western river area of the Rhine, this interaction would have been minimal, given that the whole region appears to have been depopulated in the Late Roman period, with only short-lived activities in the 4th century (Heeren 2015). Possibly only the military forts such as Brittenburg and Valkenburg remained. Further along the Rhine, the military

presence is more confirmed in the surroundings of Nijmegen, as well as some continued and new settlements and military reoccupation in the 4th and 5th century. This image is related to the area further south between the Meuse and the Rhine, with a corresponding abandonment mid- to late 3rd century, although continuity on villa sites appears to be a larger factor here albeit mostly for the area south of the road Bavay-Cologne. The nature of continuity also appears to have changed and no longer can be seen as the traditional surplus production centres as before (Heeren 2015). For the urban centre of Tongeren, there is no indication of a large scale abandonment, although it can be stated that its location is not in the Rhine frontier zone. It was however along the road from Cologne to Bavay, a recognised military axis, and the cemeteries around the town reveal many individuals with objects pointing to a military style and/or identity. The possible residence of units in or around Tongeren has been mentioned (see Chapter 4) and its connection in the military and economic network, via the rivers Jeker and Meuse and the inland roads leading in all directions, suggest a high degree of militarisation as the result of frequent interaction. This means that it is very likely that, to different degrees, the inhabitants of Tongeren are likely to have adopted a military life-style or imitation. The same argument of high militarisation holds true for the local communities along the Rhine and Meuse, as well as on the coast line. But also to a lesser degree for the communities residing along the roads and rivers connecting these military zones in the hinterland, which would have frequently faced troops, provisions and military personnel.

In general we can state that increasingly from the 3rd century on, these military zones and areas connected with them, would have adopted military styles to some degree. The highest degree of militarisation would have occurred in the zones with direct and frequent contact between local communities and the army, such as the Rhine frontier and the coastal plain. Arguably, the local communities were incorporated into the military economic network, which would have resulted in the need for products, such as pottery or produce, creating to some extent economic stability. It is not unimaginable that this was a contributing factor as to why the Late Roman occupation appears to cluster along rivers and roads. Furthermore, this level of interaction would have resulted in the adoption of objects that reside in the public sphere, e.g. clothing style and personal adornments. Here, the crossbow brooch has proven to be an artefact type that can be used to explore the civilian and state adoption of military style and expression by dress accessory. The development of this brooch into a symbol of power did only occur after it was adopted or imitated by non-military individuals and groups, making it a suited proxy

to follow the development of militarisation and the growing role of the military elite in Northern Gaul or possibly even the Western Roman Empire.

A second aspect of appropriating a military lifestyle would have been expressed by social actions, constructs or even beliefs, i.e. ranging from common social activities to religion. The foot-vessels might be a representation of the more accessible kind of social change. Whereas not everyone could procure military items or would have been tolerated to imitate them, simple social actions and constructs, such as a (renewed) focus on drinking would have allowed multiple layers of society to align themselves with the military lifestyle. If the foot-vessels were used or favoured by soldiers in the climate where the military was perceived as the representation of power, Rome and the emperor, this could have become a matter of fashion worth imitating.

Nevertheless, the concept of militarisation has to be considered as a heterogeneous process, by which the most directly connected societies would have adopted the most social and physical elements from the army, and the less connected would only partake in the superficial expressions for the purpose of acquiring social prestige or a sense of membership. For the studied part of Northern Gaul, it can be stated that the frontier zone contained a high degree of militarisation and was probably the instigating factor for the change in attitude towards the military, already initiated in the aftermath of the Gallic Empire at the end of the 3rd century. In contrast, the more secluded settlements in the central hinterland probably had only occasional and indirect contact with the military and would have taken longer to adopt the new social constructs and associated material culture. Although at present, there is not much evidence arguing for an uninterrupted continuity from the 3rd to the later 4th and 5th century in the less connected rural hinterland. These areas were probably more influenced by the arrival of new settlers bringing rather a cultural interaction than a social influence.

9.2.2 The role of migration

Material culture studies in archaeology far too often use migration as an explanation for the presence of exotic material, besides importation. Generally, factors such as scale, impact and interaction are underestimated, as well as local innovation or invention as a substitute for non-familiar materials. By the many uncertainties and alternative explanations for how non-local artefacts arrived in a certain context, it has been argued that archaeology is an insufficient tool to study past migrations. This is mainly connected

to the 'cultural history' approach that accompanies the generalising conclusions, i.e. pots equal people. Although the handmade pottery studied here could be seen to align with that paradigm, many different factors have been taken into account before concluding to relate non-local pottery with immigrants. As discussed in the chapters, these immigrants or non-local pots do not represent a sole ethnic group, but rather a wide spread of a number of different regions, varying chronologies and corresponding different explanations and hypotheses. Additional focus has been given to the scale as well as the impact of interaction that resulted in changing techniques and the merging of material culture. It is this process of transformation in which migration can be seen as a catalyst for cultural change in the rural and military communities of Late Roman Northern Gaul that we will elaborate on.

In general, the nature of the migration between the Roman and Germanic territories are summarised by Halsall (2007, 419) as follows:

> 'The relationship between the Empire and the barbaricum provide the essential context for population movement. The Empire had long provided careers for trans-Rhenan and other barbarians. Many returned home and used their service in the Empire as basis for local standing. Other stayed to build lives in the Roman territory.'

When applied to the most northern Rhine frontier and the migrations there, we have to take an additional set of factors into account. Halsall (2012, 420-421) notes that the importance of 'knowing the way' cannot be underestimated. Although the general direction of the Roman Empire would have been known to a great distance from the borders, the specific points of access would not. Which leads to the next requirement, i.e. the support from a local network within the destination area. This would have been necessary to ensure safety and communicate knowledge on available lands for a settlement, but also as an official legitimation for these new settlements. This would have been easiest in the frontier zone, where political non-Roman authorities were most likely found. And the routes provided for the migration are considered to resemble the trading routes, i.e. the major rivers, crossing the Rhine via existing bridgeheads and continuing into the hinterland via other main networks. Which in our case consists of the Meuse, Scheldt and a number of primary and secondary roads.

However, it has also been argued by Halsall (2012, 32) that migrants usually leave no indications in the material culture, given the often rapid adoption of culture of the new territories. And therefor, only Roman migration or mobility into *barbaricum* is visible in

the archaeological record. In contrast, Burmeister (2000) has provided us with some tools to counter this statement by using the 'internal cultural sphere', which is most closely connected to the habitus and tradition of a community. Heeren (2016) applies this notion to the building techniques and diet as evidence for migration from outside the Empire into Northern Gaul. He argues that these elements, which are considered belonging to the internal cultural sphere, are only adopted rapidly from local communities if there are external factors that make this change in tradition beneficial. For instance, the change in building technique is influenced by environmental and climate factors. In our case, the Germanic immigrants from the opposite side of the Rhine came from a very similar landscape within the same climate and thus would have had no need to immediately adjust their building technique. By this he demonstrates the rise of new populations and the joining of new settlers in existing communities by the three-aisled byre house and sunken hut features.

This line of reasoning can be followed for the handmade pottery as well, although in the opposite direction. We have seen that the local production technique was adopted on all sites with Germanic dwellings and/or handmade pottery of which the clay source could be traced back to territories outside the Roman Empire. It can be argued that the adoption of the tempering technique was out of (partial) necessity, due to the lack of naturally occurring stones in the landscape. Since Germanic people from the north normally used clays with rock inclusions for their handmade pottery, they needed a replacement to obtain the coarseness or look required by tradition. Even the change in temper choices can be appointed to the arrival of new communities, whether they were a reaction of the local communities on the adoption of their techniques by the immigrants or a way to express a distinction between 'us and them'. Admittedly, the diversification and the multi-ethnic nature of the new Germanic coalitions during the 4th and 5th centuries (Heather 2015, 14-15) does not allow us to connect specific temper choices to ethnic identities, which was never the aim of this study. Halsall (2012, 34) observes, quite correct, that '*archaeology does not and cannot in itself reveal ethnicity*'. Nevertheless, the handmade pottery, the construction techniques of dwellings, the changes in burial rites and the evidence for diet provide us with a rather wide variety of factors that all point towards the process and impact of migration in the 4th and 5th century. Furthermore, whereas we cannot reconstruct ethnicity, the appearance of non-local material and the changes in the studied society can be observed and interpreted. Heather (2015) indicated that, for the larger Germanic groups of the 4th and 5th century, ethnicity did not matter as

much, given that they were formed in their recent past or on the move. For instance, the Merovingian Franks were new political formations of which none were ancient, longstanding, endogamous population groups, where identity was very flexible and united in a political construct, rather than an ethnic one.

While the handmade pottery and dwellings inform us mainly on the aspects of migration in a rural setting, the Germanic or *barbarian* influence on the military is much more attested. Their direct presence in military units has largely been established by historical research and confirmed in the burial record. Their presence had an influence on clothing, appearance and even military strategy. Although soldiers from Germanic origin or descent would have adopted the Roman material culture very quickly, and therefore obscuring the migration or mobility on an individual level, the influence of the longstanding interfacing or interaction had become apparent and expressed in the material culture. This counters the statement by Halsall (2012, 32) that the many thousands of barbarians that crossed into the Roman Empire had left no archaeological trace of their presence. On the individual level, this is correct, although the perception of an archaeologist is not limited to only small scale identifications. For tracing impact and change as a result of migration over the span of multiple generations, the archaeological record does provide useful tools when applied to the proper scale and with sufficient consideration of context. Alongside with the four indications given above, we have argued another possible material expression as the impact of multiple generations of contact, i.e. the foot-vessels.

Overall, we can conclude that migration can be traced by archaeology, although the difficulties and limitations have to be acknowledged. However, when applied on the right scale and to types of material culture that express tradition or are the result of a mixed or merged society, the impact of migration can become apparent. In this case, people had been crossing the Rhine into the Roman Empire for many reasons already from the 1st century on. It was not until the later 3rd century and 4th century that the number of *barbarians* that stayed increased to such a level that it had an impact on the social and cultural development of the Western Roman Empire. For Northern Gaul specifically, we could argue that the post-Gallic Empire period left a vacuum in the frontier and its rural hinterland, which were exposed to increasing levels of interaction with Germanic individuals and communities. If we can take the word of Ammianus, many barbarian communities had settled illegally on Roman territory in the 4th century (e.g. AM. XVI.11), implying that a network of Germanic communities existed in the frontier zone and

beyond, providing the opportunity to people to settle in the (abandoned) regions. Their presence, legally and illegally, influenced the frontier society in a whole, creating new dynamics in which communities had to express their distinction from one another (e.g. temper in handmade pottery), but also caused the merging of social practises (e.g. foot-vessels) and the emerging of new practices (e.g. 'weapon' burials). For the 3rd century it might be possible to distinguish between Roman and Germanic as a measurable identity in the archaeological record, but by the 5th century this had changed completely and it is best to focus on the changes in traditional aspects and the development of new practices to understand this 'blended' society. As Halsall (2012, 29) states:

> 'We must see the Roman and 'barbarian' regions as interlinked parts of the same world rather than as two antagonistic, opposing, confronted worlds.'

9.3 Changing attitudes in Northern Gaul

Until recently, the general obscure nature of Late Roman archaeology in Roman studies concerning areas from Northern Gaul often forced scholars to conclude with a very brief note on the situation from the late 3rd century onward, due to insufficient knowledge or often a complete lack of evidence. For example, De Clercq (2009, 499), researching the Menapian region (corresponding roughly to the western part of our research area) stated that

> 'the Late Roman period is archaeologically an inconceivable time and the knowledge on the nature and transformations of rural social systems are close to non-existing.'

This poor state of knowledge resulted from factors such as recognisability, visibility and preservation, but also the nature of the habitation and society played a significant role in its archaeological absence. The Late Roman society was less densely populated and less industrious regarding the rural and specialised exploitations of the land. Furthermore, given the limited variety of the total amount of different classes of material culture, it is very likely that the amount of objects made out of perishable materials, animals and produce had once again become the major commodities handled in everyday life. This also relates to the change in the economic situation, where a more small-scaled exchange

and trade would have been the norm with only a very small or specific persistence of the monetary system. In short, it is clear that the 4th to 5th century in Northern Gaul is different from the 2nd to 3rd century on a social, economic, political and even cultural scale. Pinpointing the exact time and circumstance of the changes is next to impossible. However, we can evaluate how the Late Roman society differed from the mid-Roman period.

9.3.1 The coastal plain and sandy soils

Certain areas within Northern Gaul have been well researched in larger synthesis studies for the 2nd to 3rd century, allowing us to compare the general societal markers and investigate the transformation from mid- to Late Roman. The most relevant here are the Menapian area in the west and the Lower Rhine area in the north and east, corresponding roughly to the Flemish and Dutch sandy soils between the coastal plain and the Rhine. The western part was characterised by a rural non-villa landscape based on a 'subsistence and a little more' system of mixed agriculture and specialised exploitation with connections to the larger (monetary) market economy (De Clercq 2009, 497-509). This predominantly peasant society was mainly located on the acid sandy soils that did not permit a large-scale surplus production of cereals, leading to a regime of mixed crop and cereal production and animal husbandry. An additional important factor, the important specialised industry of salt exploitation in the coastal plain. Starting at the end of the 1st century, throughout most part of the 2nd, this area knew expansion and growth driven by the rising number of people that did not sustain themselves, such as military or urban populations, as well as the pressure of the Roman taxation system (De Clercq 2011, 248-249).

However, the absence of villas indicates that the majority of the landscape was not orientated towards the monetary and market economy based on cereals. Wealth and social status were expressed by commodities such as the scale of cattle and harvest a person or family owned. Furthermore, the social competition was performed on a localised internal scale within communities rather than competing with other communities. This concept of internal competition downplays the level of change in social stratification and creates a conservative society that has a higher persistence of traditions (De Clercq 2009, 497-509; 2011, 253-254). Additionally, little tangible exists for direct intervention of Rome on local societies during this time. Not to say that the

influence of Rome was absent, but rather that the transformations from the Early Roman period were initiated by indirect changes that the integration of the area in the Roman socio-economic network brought. Despite the growth and expansion in the 2nd century, the 3rd century saw a decreased occupation density, despite the increased military presence and (temporary) stability provided by the Gallic Empire.

This decrease in occupation in number and size continued for the 4th century. No indications were found to argue a continuity of the salt exploitation and it appears that the pastoral nature of the peasant societies persisted as well, albeit in much lower concentration. Most traces of habitation were found along the roads and rivers, although, it is possible that the more dispersed and less permanent structures created by a pastoral lifestyle are just not visible in the archaeological record. It is therefore impossible to state how present or absent the rural population was on these sandy soils. The military presence at the coastal plain remained and the importance of the inland roads as an military-economic network have already been stressed before. It is clear that the landscape itself was not forsaken or abandoned for long periods of time, although also no new phases of growth or expansion, other than the military forts, are visible. Continuity from the 3rd to the 4th century has been noted along the course of the Scheldt with the most active area in the Lys-Scheldt valley, pointing out again the importance of connectivity, in this case with the economic and military centres from *Belgica Secunda* further south. It is also along these lines of connectivity that the first traces of Germanic presence appear. Whether these are individual or communities starting a new settlement or joining a local settlement, voluntarily or forced, remains often unclear. Nevertheless, the presence of individuals and groups from Germanic origin and descent slowly increases towards the end of the 4th and the 5th century. From the discussion above, we might say that the pattern currently present in the archaeological evidence points to a chain migration in which individuals and small groups of people enter this part of Northern Gaul over the course of multiple generations. The scale of this movement or migration is rather a 'trickle' than a 'flood', probably already starting in the late 3rd century and continuing in more or less a similar pace until the second half of the 5th century.

9.3.2 The Lower Rhine frontier

A similar yet different image presents itself for the northern and eastern parts of the research area that belong to the general Lower Rhine frontier zone. After initial phases of growth, multiple parts of the landscape seem to have become abandoned completely. First, the western part of the river area already appears to have been depopulated between the end of the 2nd and middle of the 3rd century. Only short-lived, arguably military, 4th century activities occurred (Heeren 2015, 287-288). This appears to be an extension of the situation in the coastal plain and the adjacent hinterland from the area to the south. Second, the rest of the northern Rhine frontier witnesses a decline in size and number of rural settlements from the late 2nd century onwards, to be abandoned between AD 250-280 and left uninhabited until the reoccupations in the late 4th century (Heeren 2015, 288-289). The reoccupations all have a Germanic character with three aisled byre houses and sunken hut features (for a discussion on the Germanic nature and reliability, see Heeren in press). In all, this image corresponds to the general patterns visible on the sandy soils of both Flanders and the southern Netherlands.

On the contrary to the landscape of the sandy soils, a different pattern emerges from the former villa-landscape of the southern part of the Lower Rhine frontier. No phases of complete abandonment are known, although the existing habitation also does decrease in size and number, such as illustrated by the shrinking of the urban centres, such as Tongeren. Additionally, the transformation of former mixed military-civilian centres to apparently solely military camps or forts, such as at Cologne, illustrates the decrease of rural component and the increase of the military nature of the frontier zone. The villa settlements between Tongeren and Cologne are continuously or discontinuously occupied from the late 3rd to the 4th century (Heeren 2015, 289-290). On the nature of this (squatter) habitation is much discussion. Nonetheless, people were actively living and using the area, albeit for different reasons than the traditional economic surplus exploitation for the Rhine frontier, landowning elites or taxation.

The cause(s) of these phases of abandonment is not yet clear. Heeren (2015, 291-294) lists the main candidates, although it is evident that these were not the result of multiple barbarian incursions that laid waste to the land. Little evidence of destruction has been found and the abandonment is in certain areas too complete to have been caused by an external threat. In addition to warfare, an environmental explanation is often sought for the process of abandoning lands. In this case, soil degradation or *agri deserti* (Theuws 2009)

as a consequence of intense exploitation and over-taxation in the 2nd century. Although this undoubtedly would have been a factor on a local scale, it is not a satisfying explanation on its own for the depopulation of entire areas. Additionally, plagues or epidemic outbreaks are considered major causes for abandonment, although it is unlikely that they caused complete depopulation. Furthermore, mass graves from this period are missing in the region. A last possible explanation, posited by Heeren, is the forced or guided relocation of rural communities from the frontier zone to compensate the abandonment and/or loss of exploitation in the villa area. The role of the Gallic Empire or Aurelian politics are suggested as instigators of this relocation project.

Although the option of relocation can be viable for the abandonment in the frontier region, it does not explain the gradual decline in settlements seen on the sandy soils or in the former villa-landscape. If the frontier communities had to fill the lands of the former villa-system to uphold the exploitation needed for the Roman Empire, where did the original villa habitation go to? Perhaps additional factors have to be taken into account that explain the more organically declining occupations. For instance, abandonment caused by increased military presence and change in supply arrangements is not unimaginable. Much of the 4th century grain-provisions for the Rhine frontier could have come from Britain that flourished in the 4th century and could have replaced the need to exploit the direct country side in the frontier zone and direct hinterland. Possibly a chain of events caused the change in organisation of supplies for the army. First, localised or more general soil degradation occurred at the end of the 2nd century as the result of over-exploitation of the poor sandy soils. Second, the socio-economic environment in the 3rd century changed before and during the Gallic Empire. Third, at the end of the 3rd century, the Tetrarchy changed the organisation the military establishment in general and presumably also the supply arrangement. This chain of events is over-simplified, but demonstrates that over the course of more than a century, the circumstances that impacted the exploitation of the countryside and the corresponding settlements would have changed significantly, resulting in different pan-regional organisation and adjustments to the local communities. By transferring the burden of military grain supplies from the local rural communities to another province, the taxation and pressure would have been reduced. Leading first to the abandonment of the more marginal soils and second to the lack of effort in repopulation of land that did not need to be exploited for a 'subsistence and a little more' model. The communities in the frontier zone could have maintained a direct relation with the military to provide

them with additional products, although if the relocation of rural communities did occur from the late 2nd or early 3rd century, these could also have contributed to the change in supply organisation, causing a gradual, more natural, abandonment in the long run.

In addition to this, the large scale exploitation by a non-villa system of the former villa-landscape between the Seine and Rhine illustrates that new models are necessary to investigate the role of Northern Gaul in local, regional and pan-regional economic systems. The region of Ile-de-France has provided much information (Van Ossel 1992; 1995; Van Ossel and Ouzoulias 2000) and demonstrates the change from villa to non-villa structure. Questions concerning the surplus obtained by this agricultural landscape arose from the evidence. It has been argued that these settlements could have been part of the property of Late Roman landowning elites that resided elsewhere and thus also spent the surplus elsewhere. Additionally, the absence of the main villa-like residential buildings was often interpreted as the lack of a 'landed elite', where the class of land proprietors had disappeared in the aftermath of the 3rd century resulting in a more direct producer-consumer relationship. In this scenario, the landscape between Seine and Rhine is seen as a military procurement zone, where the surplus goes to the army quite directly. In contrast, more recently, the differences in expressions of elite representation between Late Roman and mid-Roman elites have been taken into account. Given the adoption of military styles for the new militarised aristocracy, it is likely that the focus on the main villa building was no longer required, implying that there still was a 'landed elite' collecting and spending the surplus (Esmonde Cleary 2013, 269-282).

These models do not apply on the acid sandy soils in the northwest corner of Gaul, although the continued large scale exploitation of the Seine-Rhine landscape as a procurement for the frontier zones, does support the relief of pressure on the more marginal landscape, such as the sandy soils, reinforcing the gradual 'organic' abandonment of the rural hinterland.

9.3.3 A merged society

Overall, the most northern part of Northern Gaul can be seen as a rural-military society, in which one aspect consists of the continuity of the pastoral peasant society with small-scaled exchange and trade in kind as the suspected prime economic system, although connections to the interregional network were sustained to some extent via the rivers and roads running south. The other aspect is the military presence, using the same water

and land connections between the coast and the hinterland, which would have increased the direct power of Rome and affected the notion of what it meant to be or appear Roman. Without the presence of the landowning elite, the military remained the only reflection of Rome, resulting in the adoption of military styles as means to gain social prestige. Furthermore, the relative close proximity to the Late Roman imperial residence at Trier cannot be underestimated and will surely have had an influence, especially on the eastern parts of the research area. Moreover, both the rural and military societies would have increasingly been made up from both local Gallo-Roman communities, as well as Germanic groups and people from Germanic or mixed descent. This would have caused a slow merging of rural, military and Germanic aspects, initiated in the Rhine frontier region and spread through the existing economic-military network.

From the 3rd century onwards, the processes of militarisation and migration had an impact on the society in Northern Gaul that changed the general attitudes towards the integration in the Roman world and what it meant to be Roman. The result was the development of a hybrid Roman-Germanic peasant society with a military lifestyle of which the grave of Childeric is the finest example.

10
Conclusion and further research

The general conclusion of the research presented here is that Late Roman archaeology is not absent from the Low Countries. The Late Roman period is a time period that deserves attention *an sich* in archaeology and history, and not just as the end of the Roman story or as the prelude to the Early Medieval kingdoms. As has been demonstrated by the test-case of Flanders, a re-evaluation of the approach to Late Roman archaeology is necessary. The tools provided by the Early and Mid-Roman archaeology fall short in grasping the historical reality of the 3rd to 5th century.

The reassessment of the approach to Late Roman archaeology in Flanders and the Low Countries in general will lead to an increased identification of this phase in our history. As is already happening in fact due to the raised awareness of the non-local houses (Wijster-like) and pottery, i.e. originating from the Germanic territories. We have also argued a more critical application of certain existing paradigms to further aid the development of the appreciation and understanding of the Late Roman period in the Low Countries. It has been demonstrated by a regional approach to settlement patterns that the Late Roman occupation is strongly related to aspects of connectivity which determined the location of continued and new settlements. Additionally it has been argued that the military activity and presence in the area would have ensured an interregional connection between the rural hinterland and the supra-regional and provincial structures.

We believe that it is necessary to look at the Late Roman landscape with fresh eyes in order to move further. Not only does the abandonment of the negative image of this period increase the chance of finding Late Roman archaeology, it has also been mentioned that the 3rd and 4th century changes in social dynamics or *mentalitées* in Northern Gaul

were highly influential in the general transformation of the Late Roman West (Esmonde Cleary 2013, 42). It has been discussed that it is important to study the frontier zones and their hinterland to understand the role of two key processes that drove the sociocultural transformation of Northern Gaul: militarisation and migration. Of course there are other processes that played crucial roles in the development of the Late Roman society, such as the rise of Christianity, as well as changes in economic, political and environmental circumstances. Nonetheless, the processes of militarisation and migration acted as a catalyst in which the interaction of internal and external causes created a hybridisation of the existing Roman society within Gaul and arguable the larger Roman world.

In addition to contributions to the archaeological and historical narrative, the interdisciplinary mind-set and integrated approach that has been applied here has shown merit and promise in the use of material culture to discern social and cultural aspects. The main conceptual frameworks of *chaîne opératoire* and object biography were combined with the influence of Bourdieu's school of thought on archaeology. The general approach sought to reconstruct matters of production and consumption from a bottom-up perspective to understand material culture and its social significance. This led to a focus orientated mainly on context and physical attributes of material culture as the expression of identity and social structure.

Furthermore, some new avenues were explored as well by combining several methods. First, the use of fabric as a proxy for 'style' – in the sense of the structured ways of doing things in the creation of material culture – allowed us to test the hypothesis of tracing migration with material culture from the traditional sphere. The results provided by the handmade pottery are very promising and hold much potential in further exploring this relation between traditional household pottery and mobility.

Second, the use of typology combined a classification and a variation approach in order to examine patterns in material culture. In handling both approaches to typology as complementary aspects, we were able to overcome certain limitations and biases provided by either approach. For all three material culture case studies we could propose alternative arguments for household and craft production as well as discern consumption patterns that had not been noticed before.

And third, the combination of compositional and dimensional properties applied to the changes during the life cycle of the crossbow brooch revealed alternative perspectives towards investigating matters of regionality and state involvement, but also

provided some new tools to explore variation and standardisation in multidimensional artefacts.

In general it can be conclude that we believe that the 'production to consumption' approach in object-based material culture studies demonstrated much potential and has delivered many new insights that can contribute to Late Roman archaeology and hopefully will spark constructive discussion in the more general application of material culture to pursue avenues of change and transformation.

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Appendix 1:
Late Roman Inventory Flanders

This appendix provides the complete list with Late Roman sites and finds as discussed in Chapter 4. Additional lists on the coins and unconfirmed finds have been added as well. Next the list with the recalibrated radiocarbon dates and plots are given at the end.

Late Roman sites

The following list of Late Roman locations is sorted alphabetically. Included is every site with coherent *in situ* structures, datable finds or independent dates provided by radiocarbon dating or dendrochronology, which has the potential to have been an active site or area between AD 275 and 450.

Avelgem – Kerkhove – Waarmaardse Kouter

The Late Roman component from Kerkhove is very limited compared to its earlier Roman presence. The end of the Roman occupation is believed to have been caused by 'Frankish' and 'Saxons' raids in AD 260-270. A one-aisled timber construction was found on top of the rubble of a 3rd century stone construction associated with the former road-side building. The sparse material culture containing Eifel ware, *handmade pottery, a Late Roman terra nigra foot-vessel* and a coin from Constantine II places this phase in the 4th to mid-5th century. Additionally, a single Germanic female burial was found in a filled 3rd century

ditch. Among the grave gifts were a silver ring, a wooden bracelet and coin of Postumus, dating the grave approximately at the end of the first half of the 4th century.
Main references: De Cock and Rogge 1988, 13-19; De Cock 1996, 85; Lamarcq and Rogge 1996, 131.

Boutersem – Kerkom – Boskouterstraat

At this location, a Late Roman or Early Medieval sunken hut was excavated. The feature was filled with tile debris and burned clay. The lack of datable finds resulted in an unknown date. The lack of other Early Medieval traces or finds and the presence of an earlier Roman rural settlement, speaks in favour of a 4th or 5th century date. However, this remains speculation.
Main references: In't Ven and De Clercq 2005, 148-149; In't Ven et al 2005, 283-300.

Damme – Sijsele – Antwerpse Heirweg

On this rural site, traces were found containing much 3rd century ceramics, which indicated a possible continuation of the site past the AD 270 barrier.
Main references: In 't Ven et al 2005, 47-75.

Dendermonde - Sint-Gillis-bij-Dendermonde – Zwijvekekouter

On the terrain of 'Oud Klooster', a part of an Early Roman cremation field and additionally a single well were found. A C14 date placed one of the base construction planks between AD 240 and 391. This was interpreted as the reuse of old wood for the well structure, given the suspected Merovingian nature of the handmade and Eifel pottery. Additionally, the contents of the well revealed pollen of rye, which was seen as proof for an early Medieval date. These finds occurred in the vicinity of a Saxon cemetery, where Late Roman finds such as Eifel ware and brooches were noted earlier and activities for the 4th and 5th century were proposed.
Main references: Van Doorselaer and Opsteyn 1999a,b; Demey 2012.

Gavere – Asper – Jolleveld

Among the Early Roman site at Asper, a part of the Late Roman settlement was encountered, where the earlier traces had been levelled. A series of related traces contained finds datable to the 4th and 5th century. Mostly handmade pottery, although the Late Roman terra nigra foot-vessel of type Chenet 342 and the samian bowl type Chenet

320 provide a date in the second half of the 4th century to the first half of the 5th century. The Merovingian cemetery and finds suggest a continuation into the late 5th century.
Main references: Vermeulen 1986, 111-115; Vermeulen 1992; 49-50, 242-243.

Hasselt – Kuringen – Rode Rokstraat

The recently excavated site of Hasselt – Rode Rokstraat is still in processing of the finds. Preliminary report on the site states a house resembling the Wijster type and the presence of immigrants from across the Rhine on this rural settlement. This is derived from the large quantity of 'Germanic' handmade pottery, although no sunken huts are found. The preliminary date is set on the second half of the 4th and the 5th century.

Heers – Vechmaal – Middelpadveld

Among the 3rd century structures, a well was uncovered containing Argonnen samian ware from type Chenet 320 and Eifel ware. Based on these finds, the fill was dated to the Late Roman period. Based on these findings, it was concluded that the villa of Middelpadveld had a continuous occupation from the Late Iron Age to the 4th century. No evidence for destruction or fire were found, leaving the end of the occupation uncertain.
Main references: Vanvinckenroye 1997, 179-192.

Herk-de-Stad - Donk – Landwijkbroek

The excavations at Donk illustrated that only a short interruption or possibly a continuous occupation has occurred between the 3rd century and the reoccupation or arrival of new settlers in the 4th century. New structures are built in a similar orientation to the older structures. This rural settlement consist of a few houses and sunken huts and the finds from this phase can mainly be dated to the 4th century. Additionally a C14 date from a sunken hut floor level gave a date of 1740±75 BP and dendrochronology places activity at the site after AD 383, which confirmed the general 3rd to 4th century chronology. In accordance to historical sources, the new settlers arrival and occupation has been estimated between AD 325 and 400.
Main references: Van Impe 1980, 108-109; Van Impe 1981, 47-51; Van Impe 1983, 65-94; Van Impe, Strobbe, Vynckier 1984a, 78-82; Van Impe, Strobbe, Vynckier 1984b, 129-130; De Paepe and Van Impe 1991, 145-180.

Hoeselt – Hoeselt – Kerkstraat

In the recent excavation at the Kerkstraat in Hoeselt, at least six inhumations were found. Most finds were of Roman date. A general (Late)-Roman date was proposed, given the combination of inhumation and Roman finds, although an Early Medieval chronology is also suggested.
Main references: Smeets 2012, 19-23.

Hove – Hove – J.Coverliersstraat

A well with a radiocarbon date between AD 380 and 600 uncovered on the excavation at Hove is the sole Late Roman feature in a Merovingian rural settlement. A second well dated to AD 430-620. Additional a small secondary building was uncovered, which can possibly be placed in the Late Roman period, based on parallels from the northern Netherlands. Some unspecified stray finds would support a Late Roman component to the 6th century settlement.
Main references: Verhaert and Annaert 2003a, 109-110; Verhaert and Annaert 2003b, 70-72.

Kinrooi – Kinrooi – Hezerheide

A cremation burial field containing 73 Roman graves was found in the 19th century, not far from where the dock at the Meuse was found. The findings were never published and were revised in light of a dissertation. From this re-evaluation, it was concluded that the burial site was used from the 1st to the 4th century, taken into account the widest chronology of the finds. For the 4th century, two glass vessels and a Late Roman terra nigra foot-vessel were identified. It is unsure if these finds come from one or multiple graves. Additional Merovingian graves were found, but a continued use of the burial ground could not be confirmed.
Main references: Keijers 2000, 93-113, 186-194.

Kinrooi – Ophoven – Heerweg

A second Roman burial site was found in the region of Kinrooi, along the road from Tongeren to Nijmegen. According to the finds, two samian bowls type Chenet 320, it was also used for a short period of time between the end of the 4th century and the start of the 5th century.
Main references: Keijers 2000, 128-142.

Kinrooi – Ophoven – Steenberg

A docking quay was encountered on an old riverbed of the Meuse. A radiocarbon date placed it between AD 210-350 (85.7%).

Main references: Heymans 1979, 24; Keijers 2000, 191.

Knesselare – Knesselare – Kouter

The excavation on the site of Knesselare – Kouter revealed a fortified settlement with a large palisade with three entrances: a heavy gate tower A, a smaller gate tower B and a *clavicula*-shaped entrance. It is not considered to be a permanent residence and it is unclear how long the occupation would have taken place. In general, the site has to be placed between the late 2nd and the early 4th century, based on the finds it is most likely that the active use of the site took place in the 3rd century. A 3rd to 4th century date is supported by two C14 analyses from pits inside the palisade resulted in dates between AD 225-325 (1775±25BP) and AD 235-325 (1765±25BP).

The general shape and built of the fortification suggest knowledge of Roman military design. Two hypotheses for its origin are put forward. The first is that this site represents a local reinforcement without official military status built as reaction in times of crisis/instability by local leaders. These local elite were supported by state officials, with knowledge of Roman defences, potentially to guard the passing road. The second idea is that this is a fortification build by rebellious locals or *bagaudae*.

Main references: De Clercq, Hoorne, Vanhee 2005, 170-173; De Clercq, Hoorne, Vanhee 2006, 27-35; De Clercq, Hoorne, Vanhee 2007, 95-98; De Clercq, Hoorne, Vanhee 2008.

Kontich – Kontich – Erfling

A Roman well excavated in 1948 was placed in the 3rd or 4th century based on structure and a samian bowl.

Main references: Van Passen 1964, 37; Bauwens-Lesenne 1965, 89; Anseeuw 1987, 107.

Kortenberg – Erps-Kwerps – Lelieboomgaarden

The site of Erps-Kwerps uncovered a reoccupation of a Roman villa estate between the end of the 3rd and 5th century, with a preference for the 4th century based on the material culture. The most prominent indication for a Late Roman occupation comes from the archaeobotanical analyses on the fill of a well. This revealed that the surrounding overgrown terrain was cleared and the uprooted weeds were dumped in the abandoned

well. This was seen as a suggestion that at least a part of the land from the former villa was again being prepared for cultivation. Other structures could by means of stratigraphy be placed after the villa occupation, such as a kiln or oven, traces indicating stone recuperation from roads and a ditch system. Some of the material culture, such as the handmade pottery, suggests a Germanic presence.
Main references: Lentacker et al 1992, 110-131; Verbeeck 1994, 67-90.

Kortrijk – Kortrijk – Begijnhof (Artillerietoren)

A series of finds in the same area of the Begijnhof, Artillerietoren and Onze-Lieve-Vrouw of Kortrijk, reveal a real Late Roman phase. At this location, a hypocaust, concrete, mortar and an abundance of ceramic building material suggests the presence of a bath. Based on associated ceramics and coins, this bath structure could be dated to the 4th and 5th century. Furthermore, two structures with dug out features have been encountered, together with 'Germanic' handmade pottery. Also evidence of artisanal or production activities is given by ovens or kilns and metal waste. In addition, an abundance of 4th century pottery is frequently found in this location.
It is not quite clear if the central place of *Cortoriacum* (Kortrijk) remained a central place with some urban characteristics in the Late Roman period or if it transformed more into a rural orientated settlement. In general, it is assumed that the populated area of *Cortoriacum* in the 4th century was reduced and located more to the west than in the 3rd century. Additionally, there are elements arguing the presence of a military fort. Brulet (1990) interpreted the available evidence as the emergence of a Late Roman fort under the military expansion of Valentinian guarding the river Lys in the Mid-Roman *vicus*. Here, we can add the reference in the *Notitia Dignitatum* to the military unit of the *Cortoriacenses*, which is thought to have been stationed in Kortrijk.
Main references: Brulet 1990, 116, 153; Van Doorselaer et al 1990; Despriet 1992; 1993; 1994; 1995; 1997; 2001; 2002; 2003; 2004; 2012.

Kruishoutem – Kruishoutem – Kappellekouter

The bulk of the Late Roman occupation has never been completely excavated. Its location is considered to be in the same location as the previous central place of Kruishoutem – Kapellekouter. The only structure in situ is a well with a Late Roman terra nigra foot-vessel of type Chenet 342 in its fill. In addition, a large quantity of 4th century bronze coins was found, as were some Germanic brooches that can be dated to the second part of the

4th century and first half of the 5th. The site is considered to have a continuous occupation from the 3rd century to the Merovigian phase, although with a change in its population. It is also thought possible that the religious function of the site survived in the 4th century, indicated by the find of a part of a bronze cult statuette in the same fill as the Late Roman terra nigra foot-vessel.
Main references: Vermeulen 1992; Vermeulen, Rogge, Van Durme 1993, 58-74, 172-174; Rogge and Beeckmans 1994; Rogge and Braeckman 1996, 88-102.

Lanaken – Neerharen – Hangveld

In the direct vicinity of the destroyed 3rd century villa of Neerharen-Rekem, a new rural settlement emerges in the second half of the 4th century, characterised by house plans that appear to originate north of the Rhine and a large number of sunken hut features (ca. 30). These new settlers were interpreted as (Salian) Franks, possibly linked to the migration/relocation under Justinian, although plenty of imported ware was found in the sunken huts as well. The site reoccupation is more precisely dated to start between AD 360 or 380 and 400, based on numismatic evidence. The new settlements continues to exist throughout the first half of the 5th century. Other finds support this general date range and both pottery and metal finds illustrate the Germanic nature of the settlement. The recent numismatic study put forward some new considerations, beside the classic immigrated Germanic tribe. The presence of a high concentration of coins is considered to be linked to the military aspect of this region in Northern Gaul, or to the vicinity of urban centres such as Tongeren and Maastricht. The structures and material record of Neerharen-Rekem speak in favour of a rural community focussed on agriculture and small scale productions. Besides the hypothesis of Germanic mercenaries/soldiers, an monetary exchange of surplus or products for bronze coins is suggested. The latter would indicate that the new Germanic settlers are well-integrated in the Roman economic and monetary system. As far as the archaeological record can tell, the site occupation appears to have ended with the 5th century settlement and was not reoccupied again until the 7th century.
Main references: De Boe 1982, 70-74; De Boe 1983, 69-73; De Boe 1984, 132-133; De Boe 1985, 60-62; De Boe 1986, 26; De Boe 1987, 53-56; Stroobants 2013, 71-128.

Lanaken – Rekem – Sint-Petronella

In the vicinity of the Roman and Germanic settlement of Neerharen-Rekem, a square structure was excavated. It has been considered to be a Gall-Roman temple or an early Christian church, given that it was found underneath a small Romanesque church. Additionally, the 2nd and 3rd century Roman cemetery at the St. Petronella chapel contained a grave dated in the 4th century, based on the pottery found. Other finds from this location revealed samian sherds and Eifel ware that can be dated to the 4th century as well. These elements can be viewed as a continued occupation of the burial site into the 4th century. Given that the later church was built on top of the Roman square structure, it is also possible that the site remained in use into the Early Medieval period.
Main references: Claassen and Janssen 1972; Janssens 1982.

Lanaken – Rekem – Steenweg

In the vicinity of the Roman and Germanic settlement of Neerharen-Rekem and the St. Petronella structure, some Roman burials were found on the location also known as '*De Tombos*'. One burial contained a cremation with a 4th century pot.
Main references: Jannsens 1982, 125-127, 137.

Landen – Landen – Sint-Gertrudiskerk

Among the Merovingian traces and burials near the church, two graves were discovered that were believed to predate the Merovingian phase. A possible 5th century Frankish identity was ascribed to them. No grave goods were determined to shed more light on the matter.
Main references: Provoost 1981, 32; Piton 1981, 36.

Landen – Wange – Damekot

The Late Roman rural settlement at Wange was situated in the remnants of landscape filled with abandoned villa estates. The villa at Wange itself was burnt down in the middle of the 3rd century. Excavations only uncovered eight sunken huts from the new occupation in the vicinity of the former villa building. From the material recorded, several phases were reconstructed for the 5th century. The first settlement consisted of two farmsteads with sunken features, after which two more sunken huts were added, approximately around AD 475, and one was given up. By the late 5th and early 6th century, a new sunken structure was added. Additionally, at a short distance of these Late Roman

features, some Frankish graves were discovered. Finds placed some burials in the middle of the 5th century.
Main references: Lodewijckx 1991a, 46-50; Lodewijckx 1991b, 41-46; Lodewijckx 1996, 214-220; Opsteyn and Lodewijckx 1998, 13-16; Opsteyn and Lodewijckx 2000, 29-34; Opsteyn and Lodewijckx 2001, 217-230; Opsteyn and Lodewijckx 2004, 125-155.

Linter – Overhespen – Korte Walsbergenstraat

Already early on, some inhumations with 4th century Argonnen samian ware type Chenet 320 were fonud in Overhespen and interpreted as possible Late Roman or Frankish graves. Additional excavations in the 1980's and 1990's in the direct area uncovered more 'Frankish' graves. The complete burial ground appeared to have been plundered in the past. Only one grave was preserved well enough to date the contents of the burial ca. AD 440.
Main references: Van Doorselaer 1964, 28-29; Niclaes 1988, 150; Lodewijckx and Hombroux 1984, 17; Lodewijckx 1991a, 46-47; Lodewijckx 1991b, 43-46; Lodewijckx 1996, 216-220.

Lummen – Meldert – Zelemsebaan

The recent excavation of Meldert – Zelemsebaan added a well-documented Late Roman rural site for the south of Limburg. Agricultural are supported by the identification of rye and evidence for horticulture was found by pollen analyses on the fill of a watering or drenching feature. The feature itself is indicative for husbandry activities. In association are other structures, including houses, sunken huts, secondary buildings and supportive features such as wells. Material culture places the main occupation in the second half of the 4th and the start of the 5th century. Radiocarbon dates support this with a date of AD 430-540 AD (68.2%) or AD 400-600 (95.4%) (1569±45 BP). Additionally, a dendrochronological analyses places a repair to a well after AD 411-412. In general, this active Late Roman rural component in the transition of the 4th to the 5th century displays mixed signals pointing towards Roman and Germanic residents.
Main references: Smeets and Steenhoudt 2012.

Nazareth – Eke – 's Gravendreef

The processing of the excavation in Nazareth is still on-going. The preliminary results indicate a rural settlement at the second half of the 3rd century, crossing the AD 270

barrier and maybe continuing into the early 4th century. As is indicated by C14 analyses on a sherd from a posthole of a Wijster A house. This sherd had soot on the outside, which gave a date AD 220-390 (95.4%) – AD 245-335 (68.2). Additionally, food residue was present on the inside and was tested as well. Combined this sherd was appointed a date: AD 210-340 (91.7%) – AD 280-325 (41.0%). Most finds from the final phase of this settlement appear to be handmade ceramics, of which some show Germanic characteristics.
Main references: Personal communication T. Dyselinck; report of BAAC, forthcoming.

Oudenburg – Oudenburg – Castellum

The excavation of Oudenburg – Spegelaere added much information on this Late Roman *castellum*. This fort is considered as a part of the coastal defence, known as the *Litus Saxonicum*, with parallels on either side of the channel. The excavated south-west corner revealed a complex occupation history and was divided in five phases based on stratigraphic, ceramic and numismatic considerations. The construction of the fort has been placed ca. AD 200 and three succeeding phases of wood and earth constructions took place before the third quarter of the 3rd century. The fortification was built amid a civilian settlement, which apparently disappeared in the later part of the 3rd century. The first stone construction is suspected shortly after this, with an occupation approximately between AD 260 and 280. A larger hiatus in occupation could be placed between the end of the 3rd century and ca. AD 325. From then on, the fort was probably equipped with a more permanent military residence. The end of this official military facility is traditionally placed with the withdrawal of Roman forces from Northern Gaul in the beginning of the 5th century. From the material record, it became evident that this military centre was well connected in the interregional economic networks with Britain and other Continental provinces, as well as contained a major influence and exchange with the local and indigenous elements. Additionally, Germanic elements are present in the finds from the second half of the 4th century. Furthermore, the presence of female attributes informs us that the occupation was not strictly military. The general conclusion is that for the major part of its existence, the Roman fort was not an isolated feature but very interactive on a local and regional level. The site knew an (interrupted) continuous occupation from the 3rd century into the Late Roman period and remained a focal point for Early Medieval activities if not occupation.
Main references: Mertens 1958, 5-23; Mertens 1962, 51-62; Mertens 1987; Vanhoutte and Patrouille 2003, 81-83; Vanhoutte 2007a; Vanhoutte 2007b, 39-43; Vanhoutte et al 2009.

Oudenburg – Oudenburg – Grafveld

The burial site from the military occupation in the 4th century from Oudenburg is divided in the main burial site A and a smaller burial ground B. Burial site A contains 216 inhumation graves from the second part of the 4th century. Most graves contained males, although a minor number of children and females have been found as well. The burial rite in a wooden rectangular casket and with numerous grave goods, such as crossbow brooches and belt buckles, it was interpreted as representing a regular military unit of the Roman army. The excavation on burial site B revealed only a small number of graves, which appeared to date in the first half of the 4th century. Both burial grounds were located on top of the Early Roman civilian/rural settlement.

Main references: Mertens and Van Impe 1971.

Oudenburg – Oudenburg – Riethove

Excavations at this location discovered multiple cart tracks, in which an Argonnen samian bowl from the end of the 4th and beginning of the 5th century was found. Further along the road, four inhumations were encountered. No grave goods were discovered, although one person was buried in a wooden casket. The similarities with the graves from burial site A potentially indicate a chronology in the second part of the 4th century.

Main references: Dhaeze, Decorte and Vanhoutte 2008, 35-36; Dhaeze and Vanhoutte 2009, 83-85.

Riemst – Riemst – Toekomststraat

A lead sarcophagus with inhumation was found without context. No grave goods were present inside the casket. A Late-Roman coin was found in the fill of the burial pit and a C14 analyses was performed on the skeleton. This placed the sarcophagus between AD 210 and 390 (95.4%) (1760±25BP), supporting a good chance for a Late Roman date.

Main references: Vynckier and Vanderhoeven 2010.

Riemst - Zichen-Zussen-Bolder – Bolderstraat

On the location better known as Val-Meer, three Late Roman burials were found containing one cremation and one inhumation. The nature of the third burial remained uncertain. Identifiable finds included Eifel ware, glass vessels, a belt buckle and a coin.

The neighbouring rural settlement also revealed Constantineian coins, supporting Late Roman activities in the area.
Main references: Vanderhoeven, Vynckier and Pauwels 1999; Pauwels, Vanderhoeven and Vynckier 2002, 311-312.

Sint-Martens-Latem – Brakel – Torenhuis

A part of the Germanic settlement was encountered partially overlapping the location of a Roman rural settlement. Traces of a farmstead and two sunken huts were uncovered from the late 4th and early 5th century. A coin of Theodosius and Eifel ware place the start of the Germanic occupation in the second part of the 4th century, continuing on for the major part of the 5th century and possibly even later, given the historically attested 8th century village of *Brakela*. The Germanic character seems evident from the sunken huts and the forms and provenance of some of the handmade pottery, resembling finds from across the Rhine frontier. The reconstruction of the rural activities on the site based on evidence from pollen and bone finds, indicates a mixture of agriculture and husbandry. Additional finds indicate potential metal and textile production or processing on the site, albeit on a domestic scale. Furthermore, glass and ceramic imports from the Rhine area demonstrate that this Germanic settlement had access to interregional trade from Roman economic networks, at least for the 4th century.
Main references: Vermeulen 1983, 59-65; Vermeulen, Bourgeois, Rommelaere 1988, 29; Vermeulen 1989; Vermeulen 1992.

Temse – Temse – Hollebeek

In 1956, a Roman well was found in Temse, containing finds such as Roman ceramic building material, limestone from the region of Tournai (*Doornikse kalksteen*), a basalt lave millstone (*Eifel?*) and other Roman ceramics, such as sherds from a dolium and an amphora. A date for the 4th and 5th century was suggested, confirmed by the find of a Late Roman terra nigra foot-vessel type Chenet 342. It is believed that the well was part of a larger production or processing site, although this cannot be confirmed.
Main references: Thoen 1966, 114; Dewulf 1967, 237; Thoen et al 1989, 74-75; Rogge, Thoen, Vermeulen 1990, 59.

Turnhout – Turnhout – Tijl-en-Nelestraat

A rural settlement from the 1st to the 4th century containing two houses, secondary buildings and a well that could be placed in the Late Roman phase. The two houses could be placed in the 3rd and 4th century by means of radiocarbon dating. House 7 is dated between AD 220-390 (95.4%) and house 8 is dated to AD230-390 (95.4%). This settlement appears to be a continued Gallo-Roman occupation, with no indications of Germanic elements. The reason for the end of the Roman occupation remains unclear.
Main references: De Smaele et al 2012.

Tongeren – 's Herenelderen – 1877

In 1877, at 's Herenelderen, a cremation was found with a glass vessel, two brooches and a coin of Constantine. Based on the finds, the burial was dated to the first half of the 4th century.
Main references: Van Doorselaer 1964, 144; Bauwens_lesenne 1968, 331.

Tongeren - Tongeren - Aan de Zeedijken

In 1946, an inhumation was found just outside the city wall of Tongeren. The inhumation was presumed to have been buried in a wooden casket and, based on the associated pottery, it was dated to the 4th century.
Main references: Van de Weerd and De Laet 1947, 130.

Tongeren – Tongeren – Beukenbergweg

Remnants of the 4th century town wall were found and listed in 1935.
Main references: Paquay 1935, 20.

Tongeren – Tongeren – Bilzerpoort

Location of a tower and part of the 4th century wall were found here. Paquay mentions that here the 4th century wall joins the 2nd century wall.
Main references: Paquay 1935, 11, 18-19.

Tongeren – Tongeren – Cesarlaan

Multiple finds on the location of the 2nd century wall near the temple, revealed remodelling of the earlier wall in the 4th century with new towers.
Main references: Mertens 1968, 86; Smeesters 1975; Mertens 1977, 49-54.

Tongeren – Tongeren – Clarissenstraat

On this location, a Roman basement with burn marks was found, most likely from the 3rd century based on finds from previous research in the direct vicinity. It was determined that, after the fire, the entrance to the basement was sealed. Potentially this evidence can be placed in the Late Roman phase.

Main references: Hensen, Schurmans, Vanderhoeven 2003, 31-32.

Tongeren – Tongeren – Darenbergstraat

A Late Roman burial was found at the Darenbergstraat, which is located within the area of the northeastern burial site. The inhumation was found in a wooden burial chamber/casket with multiple grave goods. Based on the Eifel ceramics, the glass vessels and its location, the grave was considered to belong to the Late Roman phase of Tongeren.

Main references: Vanderhoeven and Vynckier 2003, 77.

Tongeren – Tongeren – Jaminéstraat

Six graves containing seven inhumations (3 male, 3 female and 1 child) in caskets were found in an intervention excavation inside the boundaries of the northeast cemetery. These were interpreted to be part of the Late Roman, potentially Christian, burial ground. This was indicated by the burial method, the inhumation rite, the absence of grave goods, their orientation and the location of the graves along the road to Cologne.

Main references: Vanderhoeven et al 1995-1996, 85-96.

Tongeren – Tongeren – Kielenstraat

Three graves were encountered in the ruins of a 3rd century private building, just outside the 4th century wall. Based on stratigraphic evidence, these were placed in the Late Roman or Early Medieval phase. Two burials consisted of remnants of the 3rd century building. The only clear associated find, however, was a 2nd – 3rd century Roman circular brooch with email.

Main references: Driesen and Borgers 2008, 31.

Tongeren – Tongeren – Kliniek

A well was found containing a coin of Valentinian alongside some unspecified brooches and ceramics. Based on the coin, the well is placed in the Late Roman period.

Main refereces: Anseeuw 1987, 188.

Tongeren – Tongeren – Kloosterstraat

Four walls and remnants of a road were found in the sewer excavations of 1934-1935. Additionally, the dark earth has been found on the same location.

Main references: Paquay 1935, 13, 17; Wesemael, Klerkx, Van De Staey 2012.

Tongeren – Tongeren – Koninksemsteenweg

Part of the 4th century wall and a ditch were recovered at this location.

Main references: Vanvinckenroye 1971, 14-15.

Tongeren – Tongeren – Koppelkiststeeg

The *Bisschopstoren* was found on the corner of the Koppelkiststeeg and the Vrijthof. This tower was part of the 4th century wall.

Main references: Paquay 1935, 10.

Tongeren – Tongeren – Maastrichterstraat a

A series of walls were found here in 1934-1935, of which the date is uncertain. At the same location, a part of the 4th century wall has been found and a gate has been suggested here, although never excavated. Additionally, we can mention the presence of the dark earth layer.

Main references: Paquay 1935, Wesemael, Klerkx, Van De Staey 2012.

Tongeren – Tongeren – Minderbroederstraat

Outside the 4th century wall, three ovens connected to a shared chimney-structure were uncovered during excavations. They were dated to the 4th century based on stratigraphic evidence, two sherds and an imitation coin of Tetricus I. One sherd was a fragment of a samian bowl type Chenet 320, the other a fragment of Eifel ware. No indications regarding their function were found.

Main references: Vanderhoeven and Vynckier 1991, 4; Vanderhoeven and Vynckier 1994, 55-56.

Tongeren – Tongeren – Muntstraat

On the corner of the Munstraat and Plein, a part of the 4th century wall was found.

Main references: Paquay 1935, 10.

Tongeren – Tongeren – Noordoost Grafveld

A large burial site of Tongeren is located in the north and the east outside the city wall. The excavations of this cemetery have been a series of smaller interventions, obscuring a complete overview. It is believed to be one large necropolis and the hypotheses that this is an early Christian cemetery has been entertained since the first finds. This notion is based on some Christian symbols, the burial rite and the dominant east-west orientation. The earliest finds were noted by Lesenne and Vanvinckenroye. The most recent and detailed excavations were carried out at the Jaminéstraat and Darenbergstraat. Most frequently, the burial rite consists of an inhumation in a wooden casket. Both with or without grave goods occurred. The Darenbergstraat burial is an exception with a burial chamber and a large amount of grave goods. A ditch was found in association with the necropolis, containing Eifel ware and a samian bowl of type Chenet 320, supporting a 4th century date. In general, it was concluded from the finds that this cemetery was created ca. AD 300 and remained in use to the middle of the 5th century.

Main references: Van Crombruggen 1962, 36-41; Vanvinckenroye 1963; Van Doorselaer 1964, 146; Bauwens-Lesenne 1968; Vanvinckenroye 1970, 13; Lux 1971, 30-32; Vanvinckenroye 1982, 88-89; Brulet 1990, 263-264; Vanvinckenroye 1995, 151-184; Vanderhoeven et al 1995-1996, 85-96; Vanderhoeven and Vynckier 2003, 77.

Tongeren – Tongeren – O.L.V.-Basiliek

Beneath the current basilica in the heart of Tongeren, excavations revealed structures related to urban housing units, a water basin and a small bath. Based on stratigraphic evidence, these can be placed after the 3rd century and before the earliest church of the 5th and 6th century. Additionally, a Valintinian III coin and an inscription referring to Jupiter Dolichenus both refer to the Late Roman period. No evidence of a preceding Roman *basilica* has been found, creating doubt on the traditional explanation for the origin of the church. We can also add a part of the 4th century wall and a tower from this wall.

Main references: Paquay 1935,11 ; Van den Hove, Vanderhoeven, Vynckier 2002, 17-20; Van den Hove, Vanderhoeven, Vynckier 2003, 73-74.

Tongeren – Tongeren – Plein

Adjacent to a part of the 4th century city wall, some smaller walls, a hypocaustum and stones have been encountered. The smaller structures probably predate the 4th century city wall.
Main references: Paquay 1935, 13, 17, 23-24.

Tongeren – Tongeren – Putstraat

A series of stone structures were found beneath the Putstraat. Combined with the find of a samian bowl of type Chenet 320, these could be related to the Late Roman phase of Tongeren. The association, however, is unsure.
Main references: Paquay 1935, 13.

Tongeren – Tongeren – Regulierenplein

Foundations of the 4th century wall were found at this location.
Main references: Paquay 1935, 10.

Tongeren – Tongeren – Romeinse Kassei

In 2004, a Late Roman inhumation constructed in roof tiles was discovered within the boundaries of the southwest necropolis.
Main references: Pauwels, Vanderhoeven and Vynckier 2005, 77.

Tongeren – Tongeren – Rijknormaalschool

Excavations uncovered an elevation of a road structure that was thought to be an active road in the Late Roman phase. Additionally, the dark earth layer was found as well, containing multiple 4th century finds.
Main references: Vanvinckenroye 1965.

Tongeren – Tongeren – Sint-Catharinastraat

A series of walls were discovered with the excavations in 1934. A coin of Crispus gives a first indication towards a potential 4th century date, although the structures were found outside the 4th century wall. Additional finds from that location include also a samian bowl type Chenet 320.
Main references: Paquay 1935, 12-13.

Tongeren – Tongeren – Sint-Truidersteenweg a

A series of pits with settlement waste were found during excavations. In one of the fills, a Eifel ware pot containing glass residue, possibly implies glass production. The Eifel ware was seen as evidence for a 4th century date.
Main references: Vanderhoeven, Van Rechem, Vynckier 2003, 75-76.

Tongeren – Tongeren – Vermeulenstraat

Multiple excavations at the Vermeulenstraat confirmed the presence of Late Roman structures at that location. Most structures relate to urban private or public buildings, of which the most prominent feature is the hypocaustum. The lay-out of the foundations, remaining structures and the presence of decorated plaster led to the conclusion that the hypocaustum is part of a (luxurious) private house. Other features indicate the potential of an artisanal area, such as the find of a wooden chalk pit. Additional layers beneath the dark earth covering the 2nd and 3rd century structures and traces can be appointed to a Late Roman phase. All these structures, traces and layers have been found in association with 3rd and 4th century coins
Main references: Vanderhoeven and Vynckier 2008; Borgers, Steenhoudt, Van de Velde 2008; Vanderhoeven and Vynckier 2009, 374-375; Driesen 2011.

Tongeren – Tongeren – Vrijthof

On the location known as Vrijthof, the 4th century wall and its tower here was encountered on multiple occasions. More recent excavations also uncovered a burned layer that covered the 2nd and 3rd century buildings present here. Traces of the removal of structures were found on top of this layer. The fill of one of these traces contained 4th century Argonnen mortaria, which provided the Late Roman date. This fill was beneath the dark earth layer, which contained only Roman finds and no Medieval artefacts, pointing to a deposit at the end of the Late Roman phase of Tongeren or the Early Medieval period. Additionally, a samian bowl type Chenet 320 found earlier in the same location supports a 4th century activity. Other finds also include other pottery, ceramic building material, floor mortar and an architectural stone.
Main references: Paquay 1935, 10-11; Reygel, Wesemael 2011, 44-47.

Tongeren – Tongeren – Wijngaardstraat

At this location, the 4th century city wall was encountered, along with the so-called *Romboutstower*.

Main references: Paquay 1935, 10; Wesemael, Klerkx, Van De Staey 2012.

Tongeren – Tongeren – Zuidwest Grafveld

This large necropolis in the southwest of Tongeren outside the city walls, stretches into present day Koninksem. This cemetery was mainly excavated in the 1970's and 1980's, although more recent finds have been made within the established boundaries of this burial site, i.e. mainly between the two roads leading south from Tongeren. After the large scale excavations, Vanvinckenroye reports of 178 Late Roman graves. Mainly, these consist of inhumations, with or without grave goods, in a wooden casket and with a dominant orientation of southwest-northeast. Additionally, wooden burial chambers with Christian iconography have been encountered. The graves and grave goods demonstrate a continuous use throughout the entire Roman period.

Main references: Van Crombruggen 1962, 36-40; Vanvinckenroye 1963; Van Doorselaer 1964, 146-147; Vanvinckenroye 1970; Vanvinckenroye 1984; Brulet 1990, 264-265; Pauwels, Vanderhoeven, Vynckier 2005.

Torhout – Torhout – Sint-Pietersbandenkerk

A double squared structure was found underneath the present day St. Peter in Chains church at Torhout. It was first interpreted as a Carolingian church, an reinterpreted as a Roman watchtower. The latest excavation revealed traces outside the church that based on stratigraphy and 3rd or 4th century pottery, are potentially Late Roman. Among the oldest finds was a coin of Gratianus. Currently, it is thought to be a Roman temple with a continued religious use into the Medieval period.

Main references: Cools 1986, 81-90; Cools 1988; 84-86; Huyghe 2010; Huyghe and Hillewaert 2010, 128-140; Decraemer et al 2011, 57-62.

Zele – Zele – Kamershoek

On a 3rd century settlement, a pit was found containing pottery indicating a date in the second half of the 3rd century or early 4th century. It contained multiple Germanic pots with ties to the 'Frisian' area in the northern Netherlands and a possible 3rd century Argonnen cup with metallic hue. The presence of Germanic pottery was interpreted as a short Germanic occupation or presence on the site at the end of the 3rd century.

Main references: De Clercq et al 2003, 32-34; De Clercq et al 2005, 209-214; In't Ven and De Clercq 2005, 90-91.

Zottegem – Velzeke-Ruddershove – Steenbeke

Near the central place of Velzeke, a fortification from the third quarter of the 3rd century came to light. On the location of the villa of Velzeke-Steenbeke revealed two parallel wide ditches and a rampart with palisade. This traces of this fortification are filled with material from the former villa, implying that the villa was abandoned or destroyed before this small fort or *burgus* was constructed. Similarities with the *burgi* on the road of Bavay-Cologne are noted. Based on the finds, such as military equipment, brooches and coins of Postumus, a date ca. AD 275 was assigned. It was construed that the occupation was only short-lived and was thought to be either connected with defences erected to counter the barbaric incursions or are to be considered related to the military power of Postumus.
Main references: Lamarcq and Rogge 1996, 89-91.

Late Roman finds

The following list of Late Roman finds is sorted alphabetically. Included is every context or find without coherent structures or associated site that can be dated by its nature, associated finds or independent dating analyses between AD 275 and 450.

Aalter – Aalter – Houtem

Stray find of a *Schalenurne*, suspected to be Late Roman. Additionally, a coin of Constantine (AD 307-337) was found in the area.
Main references: Rogge and Van Doorselaer 1990, 13-14; De Clercq 1997.

Alveringen – Izenberge – 1845

Coin hoard containing coins from Gordianus III (AD 238-244), Philipp (AD 244-249) and Postumus (AD 260-269).
Main references: Thirion 1967, 99; Roumegoux and Termore 1993, 77.

Asse – Asse – Kalkoven

Coin finds from Gallienus (AD 253-268), Constantine (AD 307-337), Constantine II (AD 337-340) and Constantius II (AD 337-361).
Main references: Cumont 1905, 104-105; Desittere 1963, 5-6.

Asse – Asse – Nerviërstraat

A dark earth layer and a roof tile structure were provided a *post quem* for the second half of the 3rd century.
Main references: De Beenhouwer and Magerman 2011, 10-11.

Begijnendijk – Betekom – 1901

Coin finds of Constantine (AD 307-337), potential coin hoard.
Main references: Desittere 1963, 13-14; Thirion 1967, 53.

Beveren – Vrasene – Heilige Kruiskerk

Stray find of Eifel ware, 4th or 5th century.
Main references: Van Hove 1995, 467-468.

Bilzen – Bilzen – 1964

Stray find of an Argonnen samian bowl with roulette decoration, 4th century.
Main references: Van Doorselaer 1964, 128; Bauwens-Lesenne 1968, 23.

Bonheiden – Rijmenam – Sint-Maartensberg

Coin hoard containing bronze coins from Constantius (AD 305-306) or Constans (AD 337-350). Additionally, golden coins of Constantine (AD 307-337) were found in the vicinity.
Main references: Uytterhoeven 1939, 819; Bauwens-Lesenne 1965, 148-149.

Bornem – Branst – Luipegem

Stray find of a pottery consisting of Eifel ware, potential Late Roman terra nigra and handmade pottery with chamotte and grass-tempering. Suspected to be Late Roman.
Main references: Segers 1988, 22-23.

Bornem – Hingene – Eikevliet

Stray find of a pottery consisting of Eifel ware, potential Late Roman terra nigra and handmade pottery with chamotte and grass-tempering. Suspected to be Late Roman.
Main references: Segers 1988, 22-24; Segers 2001, 14-15, 52.

Bornem – Hingene – Heek

Stray find of Eifel ware, 4th or 5th century.
Main references: Segers 1988, 24; Segers 2001, 14-15, 52.

De Panne – Adinkerke – Oude Duinen

Stray find of Anglosaxon pottery (5th-6th century) and a glass vessel with dolphin-shaped handles (late 3rd to early 5th century), suspected continuity (Late) Roman to Early Medieval. Additionally, the fill of a peat extraction pit gave a C14 date for the 4th and 5th century. Only Early Medieval pottery was found associated with the same layer. Other Anglosaxon pottery has been found in the area of De Panne.
Main references: Roumegoux and Termote 1993, 78; Vanhoutte 2011, 5, 9.

Deerlijk – Deerlijk – 1848

Coin hoard or treasure containing ca. 45 divers coins consisting of (among others) Valentinian (AD 364-375), Theodosius (AD 379-395) and Justinian (AD 527-565). Also a small jar with a coin from Maximianus (AD 286-310) found in Deerlijk. As well as a partial samian pot with three bronzes from Constantine (AD 307-337).
Main references: Bauwens-Lesenne 1963, 20; Thirion 1967, 67; De Maeyer 1979, 74; De Meulemeester et al 1984, 49; Maddens 1990, 22.

Deinze – Bachte-Maria-Leerne – Kouter

Stray finds of Eifel ware and building ceramics, suspected to be Late Roman.
Main references: De Clercq 1997; De Clercq 1998, 61.

Deinze – Bachte-Maria-Leerne – Schipdonk

Some pits containing pottery were analysed by C14: indicating a Late Roman to Early Medieval date (1670±25BP).
Main references: De Clercq 2000, 22; De Clercq and Van Strydonck 2002, 3-6.

Dendermonde – Appels – 1934

River find of a 'Saxon' figurehead, i.e. a stem post from a boat. Placed in 4th to 5th century by C14 dating 1550±105BP.
Main references: Bauwens-Lesenne 1962, 11; Barker, Burleigh, Meeks 1971, 158; Van Doorselaer and Opsteyn 1999, 20.

Gent – Drongen – Valkenhuis

Coin hoard containing 200 coins from Postumus.
Main reference: Bauwens-Lesenne 1962, 48; Thirion 1967, 71; De Mayer 1979, 61.

Gent – Gent – St. Baafsabdij

This area of Ghent is also known as Sint-Macharius or Sint-Baafs wijk. This area has been considered to be the location of a military infrastructure in Ghent, possibly a fort (*castellum/castrum Gandavum*), however no conclusive evidence has been found. Multiple studies have revealed enough finds to argue a continued Late Roman occupation in the area. Finds include Eifel ware and coins from Gordianus III, Postumus, Tetricus, Constantine, Valens and Valentinius III. Additional, potential Germanic material was found in some pits. These pits were found in association with structures thought to have

belonged to the Late Roman period. Unfortunately, much of the material has gone missing, making it difficult to confirm this assumption.
Main references: De Smidt 1956; Van De Walle, 1979, 19; Van De Walle, 1980, 22-23; Van den Eynde 1983, 34-36, 77-79, 96-97; Bourgeois, Thoen, Trimpe Burger, 1984, 156; Rogge, Thoen, Vermeulen 1990, 64; Lamarcq and Rogge 1996, 104.

Gent – Sint-Denijs-Westrem – 1787

Coin hoard containing coins from Valentinian I (AD 364-375), Valens I (AD 364-378), Theodosius I (AD 379-395), Honorius (AD 393-423) and Constantine III (AD 407-411).
Main references: Bauwens-Lesenne 1962, 188; Thirion 1967, 148; Vermeulen 1992, 63.

Gistel – Gistel – 1877

Coin find of Constantine (AD 307-337).
Main references: Bauwens-Lesenne 1963, 36-37.

Halen – Halen – 1957

Coin find of Crispus (AD 317-326).
Main references: Claassen 1957, 205; Bauwens-Lesenne 1968, 103.

Halen – Halen – Bokkenberg

Some layers were found that were analysed by C14 and could be dated between AD 210-340 and 290-320 AD. Only handmade pottery was found in association.
Main references: Cornelis and Sevenants 2011, 24.

Hamont-Achel – Achel – 1864

Coin find of Postumus (AD 260-269) and Constantine II (AD 307-337) and additionally sherds with roulette decoration.
Main references: Bauwens-Lesenne 1968, 3.

Harelbeke – Harelbeke – Marktplein

Coin hoard containing coins from Constantine (AD 307-337).
Main references: Bauwens-Lesenne 1963, 39; Favoral and Despriet 1967, 179; Despriet 1975, 196; Ooghe, Debrabandere, Despriet 1979, 29; De Meulemeester et al 1984, 49.

Harelbeke – Harelbeke – Schipstraat

Coin find of a silver coin of Valerian II (AD 256-258).

Main references: Bauwens-Lesenne 1963, 40; Favoral and Despriet 1967, 180; Despriet 1975, 196; Ooghe, Debrabandere, Despriet 1979, 29.

Harelbeke – Harelbeke – Sint-Salvator

Spoliation of 4th century building ceramics and stones, integrated into the church foundations.

Main references: Bauwens-Lesenne 1963, 40; Despriet 1975, 197; Ooghe, Debrabandere, Despriet 1979, 33; Matton, Ferfer 1993, 10.

Harelbeke – Harelbeke – Stasegem

Coin find of Gallienus (AD 253-268) and Constantine (AD 307-337).

Main references: Favoral and Despriet 1967, 193-194; Ooghe, Debrabandere, Despriet 1979, 57.

Heuvelland – Dranouter – 1858

Assemblage of pottery, one containing coins from Postumus (AD 260-269).

Main references: Bauwens-Lesenne 1963, 30; Thirion 1967, 71; Roumegoux and Termote 1993, 77.

Heuvelland – Wijtschate - 1845

Coin hoard containing more than 1000 coins ranging from Trajan to Postumus (AD 260-269).

Main references: Bauwens-Lesenne 1963, 133-134; Thirion 1967, 175-176; Roumegoux and Termote 1993, 77.

Houthalen-Helchteren – Helchteren – 1910

Coin hoard containing 261 coins from Gratianus (AD 364-397) to Honorius (AD 393-423) and Theodosius (AD379-395).

Main references: Roosens 1962, 31; Lallemand 1961, 47-69.

Ieper – Elverdinge – 1920

Coin hoard containing ca. 700 coins from Vespasian to Postumus (AD 260-269).

Main references: Bauwens-Lesenne 1963, 31; Thirion 1967, 75; Roumegoux and Termote 1993, 77.

Ieper – Ieper – 1923

Coin find of Constantine (AD 307-337).
Main references: Bauwens-Lesenne 1963, 46-47.

Izegem – Izegem – Molenhoekstraat

Coin find of Constantine (AD 307-337).
Main references: Devliegher 1962, 17; Bauwens-Lesenne 1963, 49; De Laet and Trimpe Burge 1964, 65.

Jabbeke – Jabbeke – Gemeneweidestraat

Stray find of a crossbow brooch, Eifel ware and Argonne samian ware. Possibly end 3rd or 4th century.
Main references: De Cock, Rogge, Van Doorselaer 1986, 91.

Jabbeke – Varsenare – Zandstraat

At the terrain also known as '*d'Hooghe Noene*' some finds pointed to activities or the presence of a Late Roman settlement in the area. Among the finds were handmade pottery and a crossbow brooch.
Main references: Hollevoet 1998, 168; Hillevaert, Hollevoet, Ryckaert 2012, 71.

Jabbeke – Zerkegem – Hoge Dijken

In the vicinity of Oudenburg, traces were found implying a rural settlement, although no actual buildings or settlement structures were found. Among the finds were handmade pottery and a crossbow brooch, supporting a Late Roman date. The nature of the handmade pottery has been thought to point to a Germanic occupation.
Main references: Rogge and De Cock 1986, 74; Verhaege 1988, 76-77; De Boe 1987, 46-47; De Cock, Rogge and Van Doorselaer 1987, 41-43.

Kortessem – Vliermaal – Boschelstraat

Suspected 4th century burial containing samian and Eifel ware.
Main references: Croes 2002.

Kortrijk – Kortrijk – Gentsesteenweg

Stray find of Late Roman pottery, including Argonnen samian ware type Chenet 320, 324 and 333, as well as a Pirling 109 vessel. Thought to potentially be connected to a Late Roman necropolis.

Main references: Rogge 1988, 52; Despriet 16-17; Maddens 1990, 27-28.

Kortrijk – Kortrijk – Groeningestraat

Coin find of a Julianus (AD 360-363).

Main references: De Meulemeester et al 1984, 50; Brulet 1990, 153; Despriet 1991, 37.

Kortrijk – Kortrijk – Guido Gezellestraat

Stray finds of a samian plate and samian imitation bowl, suspected Late Roman.

Main references: Rogge 1988, 46-48; Despriet 1991, 23, 41.

Kortrijk – Kortrijk – Jozef Vandalenplein

Stray find of an assemblage containing building ceramics, architectural stones and myriad of pottery (among others Eifel ware, terra nigra, Arras ware). Suspected to be Late Roman.

Main references: Despriet 1975, 44-45.

Kortrijk – Kortrijk – Konventstraat

A (waste) layer was uncovered at the Konventstraat, containing building material (pink mortar and tiles), stones (Tournai limestone), bone and pottery (samian ware with roulette decoration and potential Late Roman terra nigra foot-vessel type Chenet 342), potentially indicating a Late Roman date. Thought to be part of the location of the Late Roman settlement or fortification, derived from in situ traces.

Main references: Rogge 1988, 45-51; Maddens 1990, 27-28; Despriet 1991, 30-31, 32, 61; Despriet 1996, 36; Hillevaert, Hollevoet, Ryckaert 2012, 71-12.

Kortrijk – Kortrijk – Onze-Lieve-Vrouwstraat

Coin find of Valens (AD 364-378).

Main references: De Meulemeester et al 1984, 50; Despriet 1991, 37-38.

Kortrijk – Kortrijk – Papenstraat

Excavations in 1970 uncovered a V-shaped ditch containing a 4th century samian sherd. Additionally, a V-shaped pit was found at the same location, containing pottery, ceramic building material and a bronze object.

Main references: De Meulemeester et al 1984, 49; Rogge 1988, 45.

Kortrijk – Kortrijk – Pieter De Cockelaerestraat

In 1951, a waste pit was found with pottery, metal (iron nails and a brooch) and glass objects, ceramic building materials (tiles) and stone (Tournai limestone). In 1973, a Roman layer and a Medieval ditch contained Late Roman pottery and a bronze 'sheath cap' and additional stray finds from 1976 and 1986 consist of pink mortar, Tournai limestine, tiles and Argonnen samian ware.

Main reference: Rogge 1988, 45-46; Brulet 1990, 153; Despriet 1991, 22, 38, 39; Hillevaert, Hollevoet, Ryckaert 2012, 71-12.

Kortrijk – Kortrijk – Plein

Stray find of a 4th century samian bowl type Chenet 320 with roulette decoration (1975).

Main references: Despriet 1976, 406; Rogge 1988, 45-46; Despriet 1991, 39.

Kortrijk – Kortrijk – Sint-Maartenskerk

Spoliation of 4th century building ceramics (tiles, mortar, Tournai limestone) and a stray find of a 4th century Argonnen samian sherd.

Main references: De Meulemeester et al 1984, 49-50; Rogge 1988, 46; Despriet 1991, 42.

Kortrijk – Kortrijk – Verzetskaai

Stray find of two samian vessels with roulette decoration, thought to be Late Roman.

Main references: Despriet 1991, 27.

Lanaken – Neerharen – Delstraat

Stray find of a Wijster hairpin and a belt buckle, 4th or 5th century.

Main references: Wesemael 2007, 15.

Lanaken – Rekem – Porte de Weset

Coin find of Arcadius (AD 395-408).

Main references: Thirion 1970, 76; Heeren 1976, 41.

Lier – Kleine Nete – 1983

Stray find of a crossbow brooch type 3/4 (Keller-Pröttel-Swift), 4th century.
Main reference: Annaert 1999, 13-14.

Lier – Lier – Florent Van Cauwenberghstraat

A ditch uncovered on this location contained Eifel and handmade pottery, indicating a 4th or 5th century date. Additionally, a grouping of postholes and a possible hearth was thought to be a Late Roman secondary building.
Main references: Bruggeman, Van Celst, Reyns 2012, 23-25, 33-34.

Lier – Lier – Paul Krugerstraat

In 1937, a coin hoard containing ca. 4000 bronze coins was found. The 4th century coins range from Constantine to Honorius (AD265-423).
Main references: Lallemand 1965, 49-87; Roosens 1966, 41; Thirion 1967, 108-109; Lallemand 1968, 22-41.

Linter – Overhespen – Walsbergenstraat

Near the site of Wange, a double V-shaped ditch was encountered, running parallel with the road Tienen-Tongeren. The assumed defensive nature of this ditch was believed to be related to the 3rd century events. Additionally, inhumation burials with 4th century Argonnen samian ware with roulette decoration were already encountered in the direct area of Overhespen.
Main references: Van Doorselaer 1964, 28-29; Lodewijckx 1991, 42-43; Lodewijckx 1996, 214-216.

Lochristi – Zeveneken – 1823

Coin hoard containing coins from Constans II (AD 408-411).
Main references: Thirion 1967; 110.

Lokeren – Keersmaker – 1819

Coin hoard containing coins from Postumus (AD 260-269).
Main references: Thirion 1967; 110.

Lo-Reninge – Noorschote – 1857

Coin hoard containing coins from Gallienus (AD 253-268).

Main references: Thirion 1967, 131-132; De Maeyer 1979, 78; Roumegoux and Termote 1993, 76-77.

Maaseik – Maaseik – Aldeneik

Coin find of Claudius II (AD 268-270).

Main references: Bauwens-Lesenne 1968, 213.

Maasmechelen – Mechelen-aan-de-Maas – Berenshoeveweg

Stray find of Roman pottery, suspected Late Roman based on the samian ware.

Main references: Claassen 1965, 284; Bauwens-Lesenne 1968, 219.

Maldegem – Adegem – Balgerhoeke

Possible 4th century finds were encountered while digging the Schipdonk canal. The reliability of these is uncertain.

Main references: Thoen and De Clercq 1995, 11; De Clercq 1997, 32.

Maldegem – Maldegem – Burkel

At Maldegem – Ede, a pit without further association was found, containing ceramic building material and a dozen sherds of handmade pottery with grass- or chaff temper. Possible 5th century. A later excavation in the vicinity revealed a Roman settlement, dated to the 2nd and 3rd century.

Main references: De Clercq 1997, 29; Crombé et al 2005, 93-117.

Maldegem – Maldegem – Vakebuurtstraat

Coin find of Numerian (AD283-284).

Main references: Thoen and De Clercq 1995, 15.

Maldegem – Maldegem – Vliegplein

Pottery and coin find of Postumus (AD 260-269). Pottery unspecified.

Main references: Thoen and De Clercq 1995, 17.

Mechelen – Mechelen – Varkensstraat

Coin find of Theodosius I (AD379-395).

Main references: Sevenants 1987, 209.

Menen – Lauwe – 1936

Coin hoard containing ca. 30 coins from Gordianus III (AD 238-244) and Severus II (AD 306-307) among others.

Main references: Bauwens-Lesenne 1963, 66; Thirion 1967, 106; Maddens 1990, 26.

Morstel – Mortsel – Steenakker

On the field of Steenakker, a series of pits were found. One of them contained potential 3rd to 4th century Germanic handmade pottery.

Main references: Verstappen 2000, 89-94.

Nevele – Merendree – Molenkouter

A fragment of a Germanic handmade pot, possibly a *Schalenurne* was encountered on this location. Parallels with Elewijt placed it in the Late Roman to Early Medieval period. The more recent stray find of a crossbow brooch (type 1 or 2 Keller-Pröttel-Swift, late 3rd – early 4th century) and a coin of Constantine (AD 307-337) support a Late Roman date for the area.

Main references: De Clercq 1997; De Clercq 1998, 61; De Clercq and Van Dierendonk 2006, 66-67.

Oudenburg – Oudenburg – Oude M

Oudenburg – Oude M refers to the area containing the Kasteeldreef, Jeugdpad and Munt Burgstraat. A suspected 4th century inhumation was encountered here containing a Pirling 250 vessel dated to AD 300-325. Additional stray finds from this area consist of samian ware, a coin of Constantius II (AD 337-361) and a crossbow brooch.

Main references: Hollevoet 1985 (unpublished dissertation).

Oudenburg – Oudenburg – Stedebeek

Oudenburg – Stedebeek is a combination of excavations and finds in the Stedebeekpad, Bekestraat and Groeningestraat. Here, multiple cart tracks were found on an inland road to the south, believed to originate from the Roman fort. Finds from the cart tracks include

4th century Argonne samian ware with roulette decoration, Mayen Eifel ware (Alzei 27 and 28) and grey to blue-grey smooth pottery. Also in this excavation, some horse burials and ca. 30 4th century coins were found as well. Additionally, some inhumations and cremations were found, but could not be dated due to the lack of grave goods.
Main references: Hollevoet 1992, 195-207; Hollevoet 1993, 207-216.

Oudenburg – Roksem – Hoge Dijken

Related to the site at Jabbeke – Zerkegem – Hoge Dijken. Also at this location, multiple stray pottery finds point to a Late Roman phase in the area.
Main references: Hollevoet 1991, 183.

Oudenburg – Roksem – Zeeweg

The so-called *Zeeweg* is an inland road, connecting Oudenburg with the rest of Gaul. This road would have been an active route in the Late Roman period and most likely also in the Early Medieval period. Related to Oudenburg – Stedebeek.
Main references: De Meulemeester and Dewilde 1986, 134-135; De Meulemeester and Dewilde 1987, 225-231; Dewilde 1988, 194; Hillewaert, Hollevoet, Ryckaert 2012, 42.

Poperinge – Poperinge – H. Hartklooster

Coin find of Maximian (AD 286-310) or Gallerius (AD 305-311).
Main references: Bauwens-Lesenne 1963, 99; Roumegoux and Termote 1993, 76-77.

Riemst – Vlijtingen – Lafelt

On the mid-Roman villa estate a V-shaped ditch was found encircling one of the stone secondary buildings. The ditch is considered to be Late Roman, function unclear.
Main references: Vanderhoeven, Vynckier, Pauwels 1999.

Ronse – Ronse – Albertpark

Coin find of Maxentius (AD 307). Additional stray finds consist of samian ware.
Main references: Crombé 1989, 105-106; Bradt and Acke 2009, 7.

Ronse – Ronse – Muziekberg

Coin find of Constantius (AD 307-308), Constantine (AD 307-337), and Constantius II (AD 337-361).

Main references: Deconinck 1963, 17; Lesenne 1978, 236.

Ronse – Ronse – Spoorwegbrug

Coin hoard containing coins from Tetricus (AD 271-274) and Constantine (AD 307-337).
Main references: Thirion 1967, 141.

Roosdaal – Strijtem – 1899

Coin find of Postumus (AD 260-269).
Main references: Cumont 1905, 482; Desittere 1963, 138-139.

Ruisbroek – Sauvegarde – Sint-Katharinastraat

Stray find of Eifel ware type Alzei 27, dated to AD 270-330, handmade pottery and 'plain' Roman pottery.
Main references: Segers 1988, 22, 24.

Sint-Amands – Sint-Amands – 1802

Coin finds from Gallienus (AD 253-268), Claudius II (AD 268-270), Victorinus (AD 269-270), Tetricus (AD 271-274), Maximian (AD 286-310) and Constantine (AD 307-337).
Main references: Thirion 1967, 147; Bauwens-Lesenne 1968, 156; Segers 1988, 24.

Sint-Amands – Mariekerke – 1939

River find of a 'Saxon' figurehead from 1939. Placed in the Late Roman – Early Medieval period based on comparison to the Appels-figurehead and the radiocarbon dating performed by the British Museum, placing it at ca. AD 352 (1598±70BP).
Main references: Barker, Burleigh, Meeks 1971, 157; Segers 2001, 23-26.

Sint-Gillis-Waas – Sint-Gillis-Waas – Hol

In the excavation in 1990 a 'Saxon' sherd with chevron decoration was found. Suspected to be from the 4th and 5th century, the associated pits and buildings were considered to be from the 4th and 5th century as well. The handmade pottery with grog (chamotte) and plant (chaff) temper was considered to resemble 'Migration period' ceramics. The site was interpreted as a Roman-Germanic settlement. A more recent study, however, contests a Late Roman date based on the house plan and the secondary building (e.g. the nine-post granary). Potentially, this settlement continues into the second half of the 3rd century.

Main references: Van Hove and Van Roeyen 1990, 30-37; Hollevoet and Van Roeyen 1992, 209-221; Hollevoet and Van Roeyen 1995, 419-444; De Clercq 2009, 5-11.

Sint-Truiden – Velm – Molenbeek

Drediging of a local stream revealed ten Roman coins. One was identified as a coin from Constans I (AD 341-346) and three others could be dated between AD 355 and 363.
Main references: Smeesters 1972, 68-69.

Temse – Tielrode – 1966

Coin hoard containing ca. 20 coins from Constantine (AD 307-337).
Main references: Thoen 1966, 72-73; Thirion 1967, 159; Dewulf 1967, 240-241; Thoen 1966, 116.

Tongeren – Piringen – Mulken

Coin find dated to AD 364-378, possibly Valens or Valentinian. Additionally, a base of a Late Roman terra nigra foot-vessel was recovered, type Chenet 320 or Geppel 273.
Main references: Nales and Bink 2005, 28, 35.

Tongeren – Koninksem – 1894

Coin hoard containing ca. 350 coins. The 4th century coins range from Constantine (AD 307-337) to Arcadius/Honorius (AD 395-423).
Main references: Roossens 1966, 41; Lallemand 1965, 89-107.

Tongeren – Vreren – 1899

Coin find of Constantine (AD 307-337).
Main references: Bauwens-Lesenne 1968, 371.

Wervik – Wervik – Sint-Maartensplein

Coin finds of Claudius II (AD 268-270), Constantine (AD 307-337) and Constans II (AD 409-411).
Main references: Brulet 1990, 117; Termote 1995, .

Wervik – Wervik – Steenakker

Stray find of Eifel ware, suspected 4th or 5th century.

Main references: Bauwens-Lesenne 1963, 130-131; Goeminne 1970, 66-68.

Wichelen – Schellebelle – Brugske

From the Scheldt between Wichelen and Schellebelle, two Wijster hairpins from the 4th or 5th century were recovered.

Main references: Verlaeckt 1995, 32-34; Verlaeckt 1996.

Zingem – Zingem – Welden

Coin hoard containing coins from Philipp I (AD 244-249) to Postumus (AD 206-269). Associated with Zingem is an iron lance tip. Its date is contested.

Main references: Thirion 1967, 178; Rogge 1979, 8-9; Rogge and Beeckmans 1994, 72.

Zottegem – Grotenberge – Leenstraat

Coin hoard containing coins from Gordianus III (AD238-244) to Postumus (AD 260-269).

Main references: Thirion 1967, 87-88; Rogge and Beeckmans 1994, 72.

Zottegem – Velzeke-Ruddershove – Velzeke

Stray find of a crossbow brooch, 3rd or 4th century. Providence debated.

Main references: Rogge and Beeckmans 1994, 58-59.

A number additional sites and finds found in the literature, reports or databases could be added to this list, although these mainly comprise of unconfirmed sites and finds of which the provenance or chronology is disputed, and were chosen not to be included here. The list has been added to Appendix 1 for consultation.

List of coins

The following list provides the LRIF entries with identified coins. The dates correspond with the reign of the respective emperors and does not represent a numismatic interpretative chronology.

Location	Date (AD)	Coins
Alveringen - Izenberge - 1845	238-269	Gordianus III - Postumus
Asse - Asse - Kalkoven	253-268; 307-361	Galienus; Constantine, Constantine II, Constantius II
Begijnendijk - Betekom - 1901	307-337	Constantine
Bonheiden - Rijmenam - Sint-Maartensberg	305-306/337-350; 307-337	Constantius or Constans, Constantine
Deerlijk - Deerlijk - 1848	286-310; 307-337; 364-395; 527-565	Maximianus; Constantine; Valentinian - Theodosius, Justinian
Gent - Drongen - Valkenhuis	260-269	Postumus
Gent - Sint-Denijs-Westrem - 1787	364-411	Valentinian I - Constantine III
Gistel - Gistel - 1877	307-337	Constantine
Halen - Halen - 1957	317-326	Crispus
Hamont-Achel - Achel - 1864	260-269; 337-340	Postumus; Constantine II
Harelbeke - Harelbeke - Marktplein	307-337	Constantine
Harelbeke - Harelbeke - Schipstraat	256-258	Valerian II
Harelbeke - Harelbeke - Stasegem	253-268; 307-337	Gallienus; Constantine
Heuvelland - Dranouter - 1858	260-269	Postumus
Heuvelland - Wijtschate - 1845	260-269	Trajan - Postumus
Houthalen-Helchteren - Helchteren - 1910	364-423	Gratianus - Honorius
Ieper - Elverdinge - 1920	260-269	Vespasianus - Postumus
Ieper - Ieper - 1923	307-337	Constantine
Izegem - Izegem - Molenhoekstraat	307-337	Constantine
Kortrijk - Kortrijk - Onze-Lieve-Vrouwstraat	364-378	Valens
Lanaken - Rekem - Porte de Weset	395-408	Arcadius
Lier - Lier - Paul Krugerstraat	393-423	Victorinus - Honorius
Lochristi - Zeveneken - 1823	408-411	Constans II
Lokeren - Keersmaker - 1819	260-269	Postumus

Lo-Reninge - Noordschote - 1857	253-268	Gallienus
Maaseik - Maaseik - Aldeneik	268-270	Claudius II
Maldegem - Maldegem - Vakebuurtstraat	283-284	Numerian
Maldegem - Maldegem - Vliegplein	260-269	Postumus
Mechelen - Mechelen - Varkensstraat	379-395	Theodosius I
Menen - Lauwe - 1936	238-244, 306-307	Gordianus III, Severus II
Nevele - Merendree - Molenkouter	307-337	Constantine
Oudenburg - Oudenburg - Oude M	337-361	Constantius II
Poperinge - Poperinge - H. Hartklooster	286-310/305-311	Maximian/Galerius
Ronse - Ronse - Albertpark	307	Maxentius
Ronse - Ronse - Muziekberg	307-361	Constantius, Constantine, Constantius II
Ronse - Ronse - Spoorwegbrug	271-274, 307-337	Tetricus, Constantine
Roosdaal - Strijtem - 1899	260-269	Postumus
Sint-Amands - Sint-Amands - 1802	253-337	Gallienus, Claudius II, Victorinus, Tetricus, Maximian, Constantine
Sint-Truiden - Velm - Molenbeek	341-346, 355-363	Constans and others
Temse - Tielrode - 1966	307-337	Constantine
Tongeren - Koninksem - 1894	268-423	Claudius II - Arcadius/Honorius
Tongeren - Piringen - Mulken	364-378	Valens
Tongeren - Vreren - 1899	307-337	Constantine
Wervik - Wervik - Sint-Maartensplein	268-270, 307-337, 409-411	Claudius II, Constantine, Constans II
Zingem - Zingem - Welden	244-269	Philipp I - Postumus
Zottegem - Grotenberge - Leenstraat	238-269	Gordianus III - Postumus

List of unconfirmed finds

The following list proved LRIF entries that could not be confirmed (TV 5) as defined in Chapter 4.

Entry name	ST	SC	Description	Note
Alveringem - Alveringem - Dorp	military	fort	hypothetical fort	assumed on present day town lay-out, no evidence otherwise
Alveringen - Hoogstade - Hoogstadestraat	trace	ditch	ditch containing Late Roman and Early Medieval sherd	no identification or other associations present
Bilzen - Rosmeer - Diepestraat	settlement	villa	Roman villa and Merovingan cemetery	no evidence for continuity
Brugge - Lissewege - Zeebrugge	stray find	assemblage	wooden object with Roman pot and bone	no identifications
Destelbergen - Destelbergen - Eenbeekeinde	settlement	rural	Eifel ware	probably Mid-Roman
Diksmuide - Beerst - Dorp	military	fort	hypothetical fort	assumed on present day town lay-out, no evidence otherwise
Dilsen-Stokkem - Dilsen - Heilderveld	stray find	pottery	pottery	original information is lost
Dilsen-Stokkem - Dilsen - Stokkemerbaan	stray find	coin	tremissis coins	identification by discoverer, no reference
Dilsen-Stokkem - Stokkem - Koeweide	stray find	stone	architectural stones	hypothetical, no supporting evidence
Edegem - Edegem - Heihoefseweg	trace	indetermined	Late Roman sherd	based solely on temper
Gavere - Baaigem - Bosstraat	hoard	silver	3rd century silver treasure	no identification or reference
Halen - Zelem - Steenberg	stray find	coin	Constantin coin	identification by discoverer, no reference
Halen - Zelem - Steenbergstraat	stray find	coin	coin	identification by discoverer, no reference
Heers - Heers - Keiberg	stray find	coin	Constantin coin	identification by discoverer, no reference
Heers - Rukkelingen-Loon - 2009	stray find	assemblage	Constantin coin and brooch	identification by discoverer, no reference
Heers - Rukkelingen-Loon - Ster	stray find	coin	Constantin coin	identification by discoverer, no reference

Hoegaarden - Hoegaarden - t Nieuwhuys	structure	well	white Gobertange stone	details of the find are lost
Hoeselt - Werm - Bovenstraat	stray find	coin	Constantin II coin	identification by discoverer, no reference
Kinrooi - Ophoven - Geistingen	burial	cemetery	pottery	published identifications are 3rd century
Kontich - Kontich - Molenstraat-Groeningenlei	structure	well	vertical planks	solely based on well construction, no finds
Kortessem - Vliermaal - Zammelen	stray find	pottery	samian bowl type Chenet 320	identification by discoverer, no reference
Lanaken - Rekem - Colmonterveld	stray find	coin	Maxentius coin	identification by discoverer, no reference
Lanaken - Rekem - Tombos	burial	cemetery	Frankish inhumations	no details published
Landen - Attenhoven - Neerlandensestraat	stray find	coin	Barbarian imitation coin	identification by discoverer, no reference
Linter - Wommersom - Walsbergen	structure	ditch	settlement discovered by arial photography	no evidence otherwise
Maasmechelen - Boorsem - Grote Straat	stray find	assemblage	coin and metal	identification by discoverer, no reference
Maasmechelen - Eisden - Kolenmijn	burial	inhumation	sarcophagus	dating uncertain
Maasmechelen - Mechelen-aan-de-Maas - Broek	stray find	pottery	samian ware and ceramic building material	no datable finds present
Maasmechelen - Opgrimbie - Heirbaan	structure	waste pit	pit with iron waste	post-depositional processes?
Maasmechelen - Vucht - Dorpstraat	burial	urn	grave	no datable finds present
Mechelen - Mechelen - Molenstraat	stray find	sculpture	Sculpture of Priapus	dating uncertain
Middelkerke - Slijpe - 1801	stray find	assemblage	coin and metal	uncertain identifications
Overpelt - Overpelt - Lindel	stray find	pottery	samian ware	Merovingian burial
Riemst - Kanne - Caestert	stray find	coin	coin	no identification
Riemst - Millen - 2008	stray find	coin	Valens coin	identification by discoverer, no reference
Riemst - Riemst - Visésteenweg	stray find	assemblage	samian bowl type Chenet 320 and ceramic building material	one surface find, no evidence otherwise
Rotselaar - Rotselaar - Winterdijk	trace	waste layer	waste layer and traces	uncertain identifications
Sint-Niklaas - Sint-Niklaas - Heiwijk	stray find	brooch	sprung brooch	Early or Mid-Roman

Stekene - Kemzeke - Voorhout	stray find	pottery	location Camasiacum	hypothetical, no supporting evidence
Tesenderlo - Tesenderlo - 1834	stray find	ring	ring	dating uncertain
Tongeren - Koninksem - 2008	stray find	key	key	identification by discoverer, no reference
Tongeren - Koninksem - 2012	stray find	coin	Constantin coin	identification by discoverer, no reference
Tongeren - Lauw - Romeinse Kassei	stray find	coin	Maxentius coin	identification by discoverer, no reference
Tongeren - Nerem - Scherpenberg	stray find	pottery	Eifel ware	one surface find, no evidence otherwise
Tongeren - Tongeren - De Schaetzengaarde	stray find	sculpture	Sculpture of Jupiter and Juno	no datable finds present
Tongeren - Tongeren - Diets-Heur	stray find	coin	Constantin I, II and Constans coin	identification by discoverer, no reference
Tongeren - Tongeren - Driekruisenstraat	structure	ditch	shallow ditch	no identification
Tongeren - Tongeren - Herenweg	stray find	coin	Theodora coin	identification by discoverer, no reference
Tongeren - Tongeren - Kellensstraat	stray find	coin	Constantian II and Theodosius coin	identification by discoverer, no reference
Tongeren - Tongeren - Linderstraat	stray find	coin	Tetricus I and Valentinian coin	identification by discoverer, no reference
Tongeren - Tongeren - Luikersteenweg	stray find	coin	Licinain coin	identification by discoverer, no reference
Tongeren - Tongeren - Maastrichtersteenweg	stray find	coin	Constantin coin	identification by discoverer, no reference
Tongeren - Tongeren - Oudenweg	stray find	assemblage	Valens coins and hairpin	identification by discoverer, no reference
Tongeren - Tongeren - Paquaylaan	burial	inhumation	two graves	no identification or reference
Tongeren - Tongeren - Sint-Truidersteenweg b	stray find	coin	4th century coins	identification by discoverer, no reference
Tongeren - Tongeren - Stationslaan	burial	inhumation	multiple graves	no mention in reference
Veurne - Houtem - Dorp	military	fort	hypothetical fort	assumed on present day town lay-out, no evidence otherwise
Veurne - Vinkem - Dorp	military	fort	hypothetical fort	assumed on present day town lay-out, no evidence otherwise
Veurne - Wulveringem - Dorp	military	fort	hypothetical fort	assumed on present day town lay-out, no evidence otherwise

Zemst - Elewijt - Driesstraat	stray find			no identification or reference
Zemst - Weerde - Bergstraat	stray find			no identification or reference
Zemst - Weerde - Kerselarenweg	stray find			no identification or reference
Zemst - Weerde - Ketelstraat	stray find	coin	Antonianus follis	no identification or reference
Zemst - Weerde - Kleine Osweg	stray find			no identification or reference
Zottegem - Velzeke - Buzegem	structure	burial	four Late Roman-Early Medieval cremations	no evidence datable before end of the 5th century
Zwalm - Nederzwalm-Hermelgem - Peperstraat	stray find	brooch	brooch	no identification or reference

Radiocarbon dates

The following list provides locations in the Flemish archaeological record that have yielded radiocarbon dates that could be recalibrated within the parameters of 1800 to 1500 BP as discussed in Chapter 4. For each entry the uncalibrated BP date and calibrated AD dates are given. Following this list are the related radiocarbon plots that correspond with the name from the KIK ^{14}C database.

Location	BP	calAD						Name KIK 14C
		68,2%	*95,4%*	*99,7%*	mean	st.dev	median	
Halen - Halen - Bokkenberg	1800 ± 30 BP	140-252	131-326	85-345	219	54	219	*Halen E314 WP8 S VN14 2*
Brugge - Lissewege - Zeebrugge	1800 ± 40 BP	138-313	94-338	80-382	222	61	220	*Brugge Fort Lapin*
Evergem - Kluizen - Kluizendok	1795 ± 25 BP	144-317	133-325	126-343	226	52	228	*Kluizendok 2006-2007 MNR10*
Jabbeke - Jabbeke - Vlamingveld	1795 ± 30 BP	143-318	132-328	87-380	227	55	228	*Vlamingveld Bark*
Tongeren - Tongeren - O.L.V.-Basiliek	1795 ± 30 BP	143-318	132-328	87-380	227	55	228	*Tongeren Basiliek TO-BA-05-102*
Evergem - Ertvelde - Rieme-noord	1795 ± 35 BP	140-318	130-332	86-381	228	59	228	*Rieme-noord 09/073-002*
Zottegem - Velzeke - Kwak	1795 ± 35 BP	140-318	130-332	86-381	228	59	228	*Velzeke Kwak V98/KWAK/V/283*
Zottegem - Velzeke - Kwak	1790 ± 45 BP	140-324	125-380	78-393	236	66	236	*Velzeke Kwak V98/KWAK/V/284-A*
Jabbeke - Zerkgem - Hoge Dijken	1790 ± 50 BP	140-324	92-381	69-400	236	70	236	*Zerkegem ZER86/5/k33/N3*
Evergem - Kluizen - Kluizendok	1790 ± 25 BP	173-322	136-326	126-346	237	53	237	*Kluizendok 2006-2007 MNR8*
Evergem - Ertvelde - Rieme-noord	1785 ± 30 BP	178-326	135-332	126-382	245	55	244	*Rieme-noord 09/189-001*
Tongeren - Tongeren - Kielenstraat	1785 ± 25 BP	180-325	137-330	127-350	247	52	245	*Kielstraat TO 06 KI graf 2 S167*
Herk-de-Stad - Donk - Landwijkbroek	1780 ± 60 BP	142-332	89-391	50-427	247	77	249	*Donk 82D0592*
Evergem - Kluizen - Kluizendok	1780 ± 35 BP	179-330	134-339	90-390	251	58	252	*Kluizendok KL-DOK nr29*
Evergem - Ertvelde - Rieme-noord	1780 ± 30 BP	216-328	137-335	129-381	254	54	252	*Rieme-noord 09/030-002*

Brugge - Brugge - St. Andries Refuge	1775 ± 30 BP	223-329	138-339	130-383	262	52	262	*Brugge St. Andries Refuge SAR.IV.12*
Maldegem - Maldegem - Vakebuurtstraat	1770 ± 50 BP	176-340	133-383	80-413	260	68	264	*Maldegem MAV 88/7/k-f*
Knesselare - Knesselare - Kouter	1775 ± 25 BP	230-325	142-337	131-380	265	47	267	*Knesselare KNES-K-05-II-S52*
Evergem - Kluizen - Kluizendok	1775 ± 25 BP	230-325	142-337	131-380	265	47	267	*Kluizendok KL-DOK MNR24*
Kinrooi - Ophoven - Steenberg	1775 ± 25 BP	230-325	142-337	131-380	265	47	267	*Kinrooi Landing*
Zottegem - Velzeke - Vicus	1770 ± 40 BP	220-335	135-379	88-401	264	60	269	*Velzeke vicus VSW97/III/1*
Zottegem - Velzeke - Vicus	1770 ± 40 BP	220-335	135-379	88-401	264	60	269	*Velzeke vicus VSW/97/2*
Neerpelt - Sint-Huibrechts-Lille - Kolis	1770 ± 35 BP	225-332	136-377	127-392	266	56	272	*Kolis Square well*
Halen - Halen - Bokkenberg	1770 ± 30 BP	230-330	138-345	132-384	269	50	277	*Halen E314 WP8 S VN14 1*
Waasmunster - Waasmunster - Pontrave	1770 ± 25 BP	236-326	143-342	134-380	273	44	281	*Pontrave WA.Pon.C14.3*
Evergem - Evergem - Hoogstraat	1770 ± 25 BP	236-326	143-342	134-380	273	44	281	*Evergem-Hoogstraat sp.01a*
Knesselare - Knesselare - Ursel	1770 ± 25 BP	236-326	143-342	134-380	273	44	281	*Knesselare-Ursel KN-RO-08 feature 206*
Knesselare - Knesselare - Kouter	1765 ± 25 BP	239-325	145-378	137-382	279	41	285	*Knesselare KNES-K-05-II-S338A*
Riemst - Riemst - Toekomststraat	1760 ± 25 BP	239-330	171-383	135-388	282	46	287	*Riemst Toekomststraat RI10TO spoor 001 vondst 007*
Zomergem - Zomergem - Vaart-Noord	1760 ± 30 BP	239-330	171-383	135-388	282	46	287	*Zomergem 10*
Tongeren - Tongeren - O.L.V.-Basiliek	1760 ± 30 BP	239-330	171-383	135-388	282	46	287	*Tongeren Basiliek TO-BA-06-133*
Oud-Turnhout - Oud-Turnhout - Bentel	1760 ± 30 BP	239-330	171-383	135-388	282	46	287	*Oud Turnhout Bentel 2009 - S017HK*
Tongeren - Tongeren - O.L.V.-Basiliek	1760 ± 25 BP	242-326	215-380	138-385	284	39	288	*Tongeren O.L.V.-Basilica TO-00-BA 44*
Beernem - Oedelem - Wulfsberge	1760 ± 25 BP	242-326	215-380	138-385	284	39	288	*Oedelem - OED-WULF-2002-768*

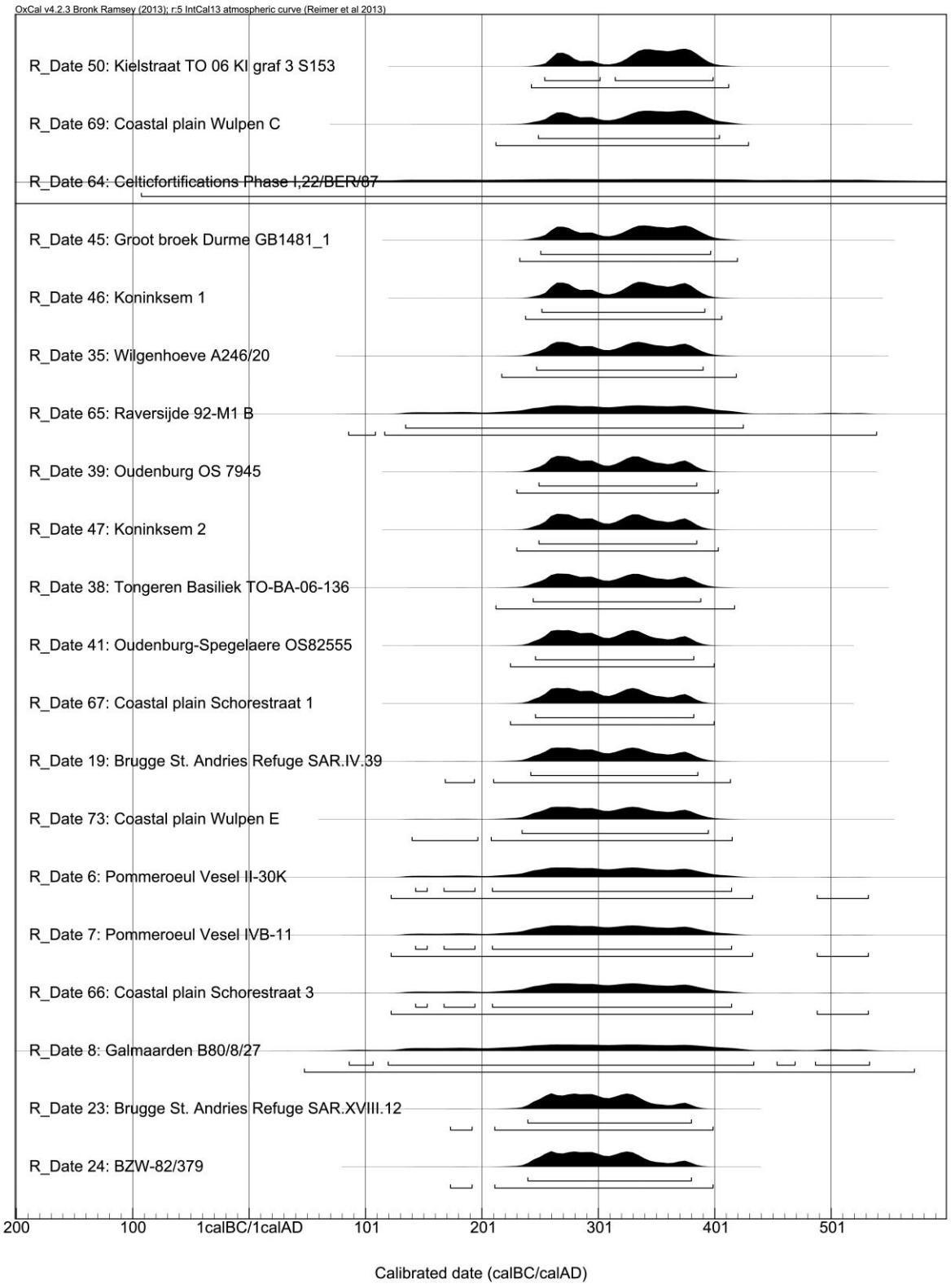
Brugge - Brugge - St. Andries Refuge	1755 ± 30 BP	242-331	180-385	136-391	287	44	290	*Brugge St. Andries Refuge SAR.IV.17*
Herk-de-Stad - Donk - Landwijkbroek	1740 ± 80 BP	180-399	83-530	24-563	288	96	291	*Donk 80DO429*
Zottegem - Velzeke - Vicus	1750 ± 40 BP	239-340	144-392	130-409	288	55	291	*Velzeke well*
Evergem - Kluizen - Kluizendok	1755 ± 25 BP	244-328	224-380	140-389	289	37	291	*Kluizendok KL-DOK MNR23*
Evergem - Sleidinge - Polenstraat	1755 ± 25 BP	244-328	224-380	140-389	289	37	291	*Evergem Polenstraat 11001 spoor478 inv.nr.476*
Evergem - Ertvelde - Rieme-noord	1755 ± 30 BP	244-328	224-380	140-389	289	37	291	*Rieme-noord 09/246-001*
Zottegem - Velzeke - Kwak	1750 ± 25 BP	248-330	232-380	142-392	293	37	293	*Velzeke - KWAK/ VO2/X/11/H*
Tongeren - Tongeren - O.L.V.-Basiliek	1750 ± 25 BP	248-330	232-380	142-392	293	37	293	*Tongeren Basiliek TO-BA-05-151*
Turnhout - Turnhout - Tijl en Nelestraat	1750 ± 25 BP	248-330	232-380	142-392	293	37	293	*Turnhout Tijl en Nelestraat 2 09012 sp625 monst92*
Antwerpen - Ekeren - Wilgenhoeve	1745 ± 25 BP	251-332	237-380	144-395	296	37	295	*Wilgenhoeve A246/59*
Evergem - Kluizen - Kluizendok	1745 ± 30 BP	250-333	231-385	138-398	296	42	296	*Kluizendok 2006-2007 MNR1*
Turnhout - Turnhout - Tijl en Nelestraat	1745 ± 30 BP	250-333	231-385	138-398	296	42	296	*Turnhout Tijl en Nelestraat 1 08024 sp228 monst29*
Herk-de-Stad - Donk - Landwijkbroek	1740 ± 50 BP	241-380	141-402	85-429	294	64	297	*Donk 84DO410*
Brugge - Brugge - St. Andries Refuge	1740 ± 25 BP	253-336	240-381	174-399	300	38	297	*Brugge St. Andries Refuge SAR.XVIII.12*
Brecht - Brecht - Zoegweg	1740 ± 25 BP	253-336	240-381	174-399	300	38	297	*BZW-82/379*
Tongeren - Tongeren - O.L.V.-Basiliek	1740 ± 25 BP	253-336	240-381	174-399	300	38	297	*Tongeren Basiliek TO-BA-05-100*
Oudenburg - Oudenburg - Spegelaere	1730 ± 25 BP	254-345	247-383	225-400	309	40	307	*Oudenburg-Spegelaere OS82555*
Brugge - Brugge - St. Andries Refuge	1730 ± 30 BP	254-376	243-386	169-414	310	43	308	*Brugge St. Andries Refuge SAR.IV.39*
Dendermonde - Sint-Gillis-bij-Dendermonde - Zwijvekekouter	1730 ± 30 BP	254-376	243-386	169-414	310	43	308	*Dendermonde Oud Klooster*

Oostende - Oostende - Raversijde	1720 ± 60 BP	251-389	135-425	86-540	312	74	316	*Raversijde 92-M1 B*
Tongeren - Tongeren - O.L.V.-Basiliek	1725 ± 30 BP	256-380	245-389	213-418	314	43	316	*Tongeren Basiliek TO-BA-06-136*
Oudenburg - Oudenburg - Spegelaere	1725 ± 25 BP	256-379	250-385	231-404	314	41	317	*Oudenburg OS 7945*
Tongeren - Koninksem - Romeinse Kassei	1725 ± 25 BP	256-379	250-385	231-404	314	41	317	*Koninksem 2*
Antwerpen - Ekeren - Wilgenhoeve	1720 ± 30 BP	258-381	248-391	218-419	319	43	324	*Wilgenhoeve A246/20*
Tongeren - Koninksem - Romeinse Kassei	1715 ± 25 BP	260-382	252-392	238-407	324	42	333	*Koninksem 1*
Tongeren - Tongeren - Kielenstraat	1705 ± 25 BP	264-386	255-399	243-413	336	42	345	*Kielstraat TO 06 KI graf 3 S153*
Zottegem - Velzeke - Vicus	1690 ± 80 BP	240-427	138-540	74-604	347	100	348	*Velzeke horse*
Waasmunster - Waasmunster - Pontrave	1685 ± 30 BP	335-400	257-419	240-509	354	42	362	*Pontrave WA.Pon.C14.1*
Tongeren - Tongeren - Kielenstraat	1685 ± 25 BP	340-395	259-415	251-424	357	37	364	*Kielstraat TO 06 KI graf 1 S178*
Hasselt - Hasselt - Sint-Quintinuskathedraal	1675 ± 35 BP	337-410	253-428	239-535	364	48	369	*Herkenrode S25*
Wijnegem - Wijnegem - Houtlaan	1670 ± 35 BP	341-412	255-527	243-535	370	49	374	*Wijnegem well*
Tongeren - Tongeren - O.L.V.-Basiliek	1670 ± 30 BP	345-408	258-428	246-534	371	41	376	*Tongeren Basiliek 83*
Zottegem - Velzeke - Kwak	1670 ± 30 BP	345-408	258-428	246-534	371	41	376	*Kwak VO1/KWAK-VII/565/laag 1*
Deinze - Bachte-Maria-Leerne - RWZI	1670 ± 25 BP	347-406	264-423	253-529	373	33	378	*Deinze RWZI RWZI-125*
Zottegem - Velzeke - St.-Martinus	1660 ± 25 BP	355-416	265-427	256-534	384	33	389	*St.-Martinus MS-76*
Tongeren - Tongeren - O.L.V.-Basiliek	1650 ± 30 BP	351-424	264-533	257-539	399	47	398	*Tongeren O.L.V.-Basilica TO-95-JA 1*
Tongeren - Tongeren - O.L.V.-Basiliek	1650 ± 30 BP	351-424	264-533	257-539	399	47	398	*Tongeren Basiliek TO-BA-05-148*
Damme - - Branddijk	1645 ± 25 BP	382-425	337-530	263-536	405	40	403	*Damme-DW7*
Tongeren - Tongeren - O.L.V.-Basiliek	1640 ± 25 BP	383-427	340-532	265-538	414	43	407	*Tongeren Onze-lieve-vrouwbasiliek 6 fraction 3*

Aalter - Aalter - Ter Walle	1640 ± 25 BP	383-427	340-532	265-538	414	43	407	*Aalter AIZ-38*
Aalst - Aalst - Sint-Jozefcollege	1640 ± 30 BP	353-505	336-535	260-542	417	50	408	*Aalst Sint-Jozefcollege 09/AA.SJC/220*
Merelbeke - Merelbeke - Oude Kouter	1635 ± 25 BP	385-503	343-534	334-539	423	45	411	*Merelbeke - Poelstraat MBC/G6*
Tongeren - Tongeren - O.L.V.-Basiliek	1630 ± 30 BP	385-530	346-536	263-544	435	52	418	*Tongeren O.L.V.-Basilica TO-01-CL 2*
Knesselare - Knesselare - Kluize	1630 ± 30 BP	385-530	346-536	263-544	435	52	418	*Knesselare Kluize 04S1 laag3*
Oostende - Oostende - Raversijde	1630 ± 45 BP	355-534	265-543	250-573	434	64	424	*Raversijde Shellfish 1*
Maldegem - Maldegem - Vake	1630 ± 50 BP	354-534	260-550	243-588	432	68	425	*Maldegem 1*
Oostende - Oostende - Raversijde	1600 ± 85 BP	381-561	252-621	138-657	451	94	458	*Oostende*
Sint-Amands - Mariekerke - 1939	1598 ± 70 BP	394-543	259-607	227-652	459	79	464	*Moerzeke-Mariekerke Figurehead*
Beveren - Vrasene - H.-Kruiskerk	1600 ± 60 BP	404-536	333-596	250-635	462	69	465	*H.-Kruis Vrasene 1*
Aalst - Aalst - Sint-Jozefcollege	1600 ± 30 BP	411-534	399-539	347-565	471	43	474	*Aalst Sint-Jozefcollege 09/AA.SJC/204-1*
Zottegem - Velzeke - St.-Martinus	1595 ± 35 BP	416-535	394-545	342-580	473	44	475	*St.-Martinus MS-67*
Hove - Hove - Boechoutsesteenweg	1590 ± 40 BP	419-535	391-560	339-599	475	47	477	*Hove 01-HO-480-SLIX-1*
Oudenburg - Roksem - Hoge Dijken	1590 ± 40 BP	419-535	391-560	339-599	475	47	477	*Roksem Ro/HD/'88/I/116b*
Aalst - Aalst - Sint-Jozefcollege	1590 ± 30 BP	420-535	406-542	381-576	477	41	480	*Aalst Sint-Jozefcollege 09/AA.SJC/198*
Wijnegem - Wijnegem - Blikstraat	1585 ± 30 BP	423-535	406-544	385-579	479	40	481	*Wijnegem blikstraat 1094*
Ronse - Ronse - Paillaertcamp	1585 ± 30 BP	423-535	406-544	385-579	479	40	481	*Ronse Poel*
Jabbeke - Zerkegem - Hoge Dijken	1580 ± 50 BP	425-536	385-595	263-637	480	54	481	*Zerkegem ZER85/5/k26*
Borsbeek - Borsbeek - Vogelzang	1580 ± 30 BP	426-535	410-546	389-581	481	39	482	*Vogelzang graf 14*
Wijnegem - Wijnegem - Steenakker	1580 ± 25 BP	426-535	418-542	397-565	481	37	483	*Wijnegem Steenakker F38(36)B*

Zottegem - Velzeke - Vicus	1570 ± 80 BP	406-568	265-644	215-671	481	83	484	*Velzeke pig*
Ranst - Broechem - Nierlenderstraat	1550 ± 25 BP	431-549	426-566	416-599	492	42	485	*Broechem VIRI CB5 (02-BROE-973)*
Lummen - Meldert - Zelemsebaan	1569 ± 45 BP	429-538	398-584	344-631	487	50	486	*Meldert Zelemsebaan*
Oud-Turnhout - Oud-Turnhout - Bentel	1545 ± 30 BP	431-559	425-579	408-610	499	46	492	*Oud-Turnhout - Bentel 10009-M020-18*
Aalst - Aalst - Sint-Jozefcollege	1545 ± 30 BP	431-559	425-579	408-610	499	46	492	*Aalst Sint-Jozefcollege 09/AA.SJC/199*
Dendermonde - Appels - 1934	1550 ± 105 BP	405-605	255-663	129-770	486	104	493	*Appels Figurehead*
Beernem - Oedelem - Wulfsberge	1540 ± 25 BP	433-562	427-577	419-604	502	46	494	*Oedelem OED-WULF2001/649*
Herk-de-Stad - Donk - Landwijkbroek	1550 ± 50 BP	429-557	405-605	348-648	501	56	498	*Donk 84DO745*
Tongeren - Tongeren - O.L.V.-Basiliek	1540 ± 30 BP	431-565	426-588	410-615	504	48	499	*Tongeren O.L.V.-Basilica TO-99-BA 15*
Wijnegem - Wijnegem - Steenakker	1540 ± 35 BP	431-567	425-594	404-630	505	50	503	*Wijnegem - Steenakker F33 III 14*
Bredene - - Onbepaald	1540 ± 40 BP	430-567	421-601	399-639	507	52	505	*Bredene Br 79/2/4*
Zandhoven - Pulle - Stuifduin	1535 ± 25 BP	433-568	428-591	420-609	508	48	513	*Pulle - 07-101-sp.258a*
Merelbeke - Merelbeke - Oude Kouter	1535 ± 25 BP	433-568	428-591	420-609	508	48	513	*Merelbeke - Poelstraat MBC/G5*
Zingem - Zingem - Lange Aststraat	1535 ± 25 BP	433-568	428-591	420-609	508	48	513	*Zingem, N60 Lange Aststraat 2010/059*
Hove - Hove - Boechoutsesteenweg	1530 ± 30 BP	433-577	428-599	417-630	516	51	530	*Hove 99-HOVE-274*
Evergem - Kluizen - Kluizendok	1525 ± 35 BP	434-590	427-605	416-641	522	54	538	*Kluizendok KL-DOK nr28*
Wijnegem - Wijnegem - Blikstraat	1525 ± 30 BP	434-585	428-604	420-635	523	52	541	*Wijnegem blikstraat 1176*
Dendermonde - Oudegem - Kloostergoed	1520 ± 40 BP	434-598	426-618	411-647	528	56	542	*Oudegem Track 8-6*
Wijnegem - Wijnegem - Steenakker	1525 ± 25 BP	435-582	429-601	422-619	525	50	544	*Wijnegem Steenakker F38(36)A*
Borsbeek - Borsbeek - Vogelzang	1520 ± 30 BP	438-596	428-609	422-637	531	52	547	*Vogelzang graf 12*

Ranst - Broechem - Nierlenderstraat	1520 ± 30 BP	438-596	428-609	422-637	531	52	547	*Broechem VIRI CB2 (02-BROE-973)*
Brugge - Brugge - St. Andries kosterijstraat	1520 ± 30 BP	438-596	428-609	422-637	531	52	547	*Brugge St. Andries kosterijstraat SAK.XIII.14*
Oudenburg - Roksem - Hoge Dijken	1510 ± 40 BP	436-607	428-636	416-650	540	56	554	*Roksem Ro/HD/'88/I/2*
Ravels - Poppel - Hondseinde	1510 ± 35 BP	474-605	428-634	422-645	543	53	557	*Hondseinde 31*
Nevele - Merendree - Dorp	1510 ± 25 BP	541-595	431-615	427-638	552	43	561	*Merendreedorp NEV-MD-10-205 (2)*
Ravels - Poppel - Hondseinde	1505 ± 35 BP	476-611	430-638	425-646	550	52	562	*Hondseinde 30*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R_Date 35: Wilgenhoeve A246/20
R_Date 65: Raversijde 92-M1 B
R_Date 39: Oudenburg OS 7945
R_Date 47: Koninksem 2
R_Date 38: Tongeren Basiliek TO-BA-06-136
R_Date 41: Oudenburg-Spegelaere OS82555
R_Date 67: Coastal plain Schorestraat 1
R_Date 19: Brugge St. Andries Refuge SAR.IV.39
R_Date 73: Coastal plain Wulpen E
R_Date 6: Pommeroeul Vesel II-30K
R_Date 7: Pommeroeul Vesel IVB-11
R_Date 66: Coastal plain Schorestraat 3
R_Date 8: Galmaarden B80/8/27
R_Date 23: Brugge St. Andries Refuge SAR.XVIII.12
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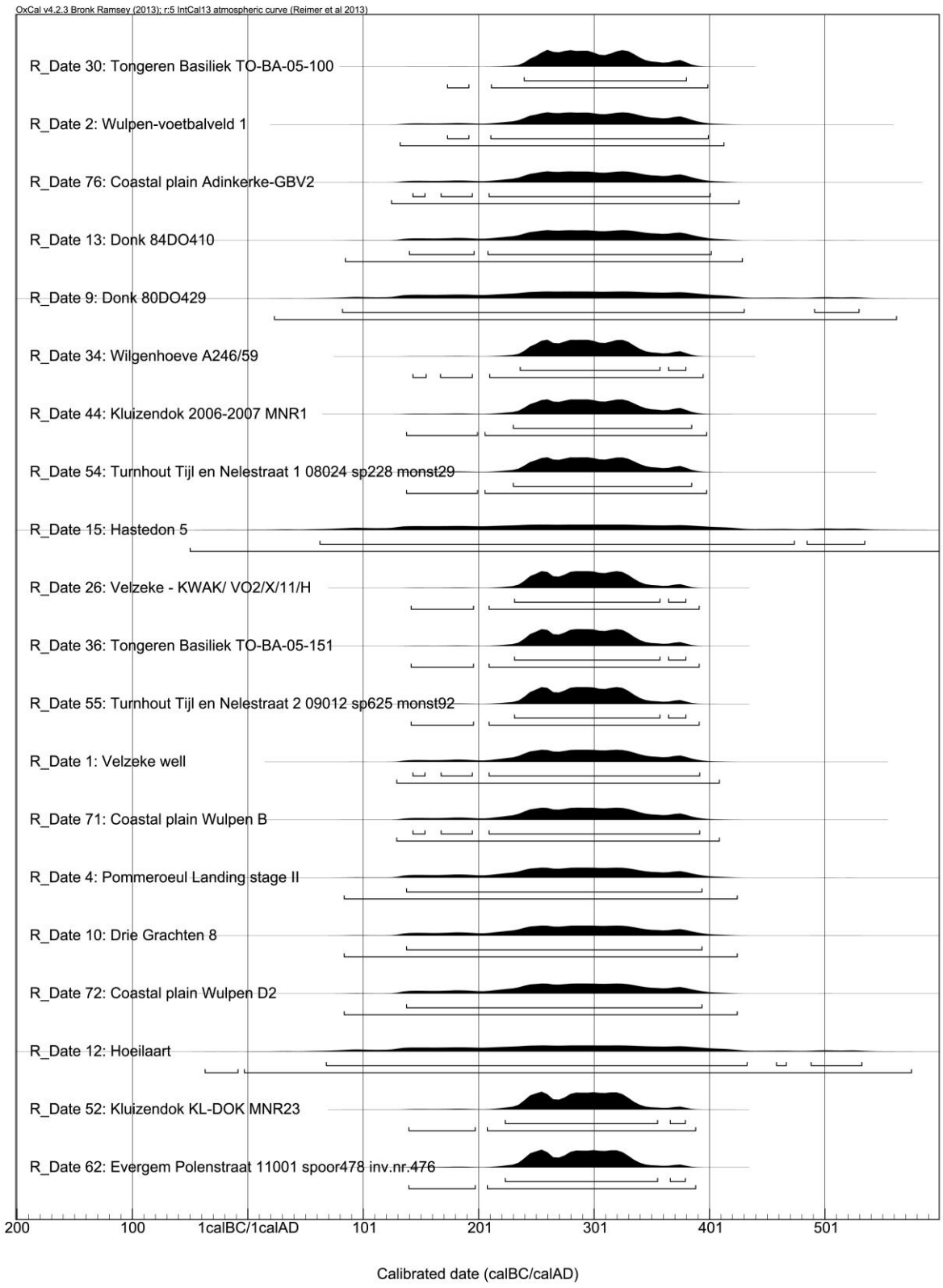
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R_Date 44: Kluizendok 2006-2007 MNR1
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R_Date 26: Velzeke - KWAK/ VO2/X/11/H
R_Date 36: Tongeren Basiliek TO-BA-05-151
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R_Date 72: Coastal plain Wulpen D2
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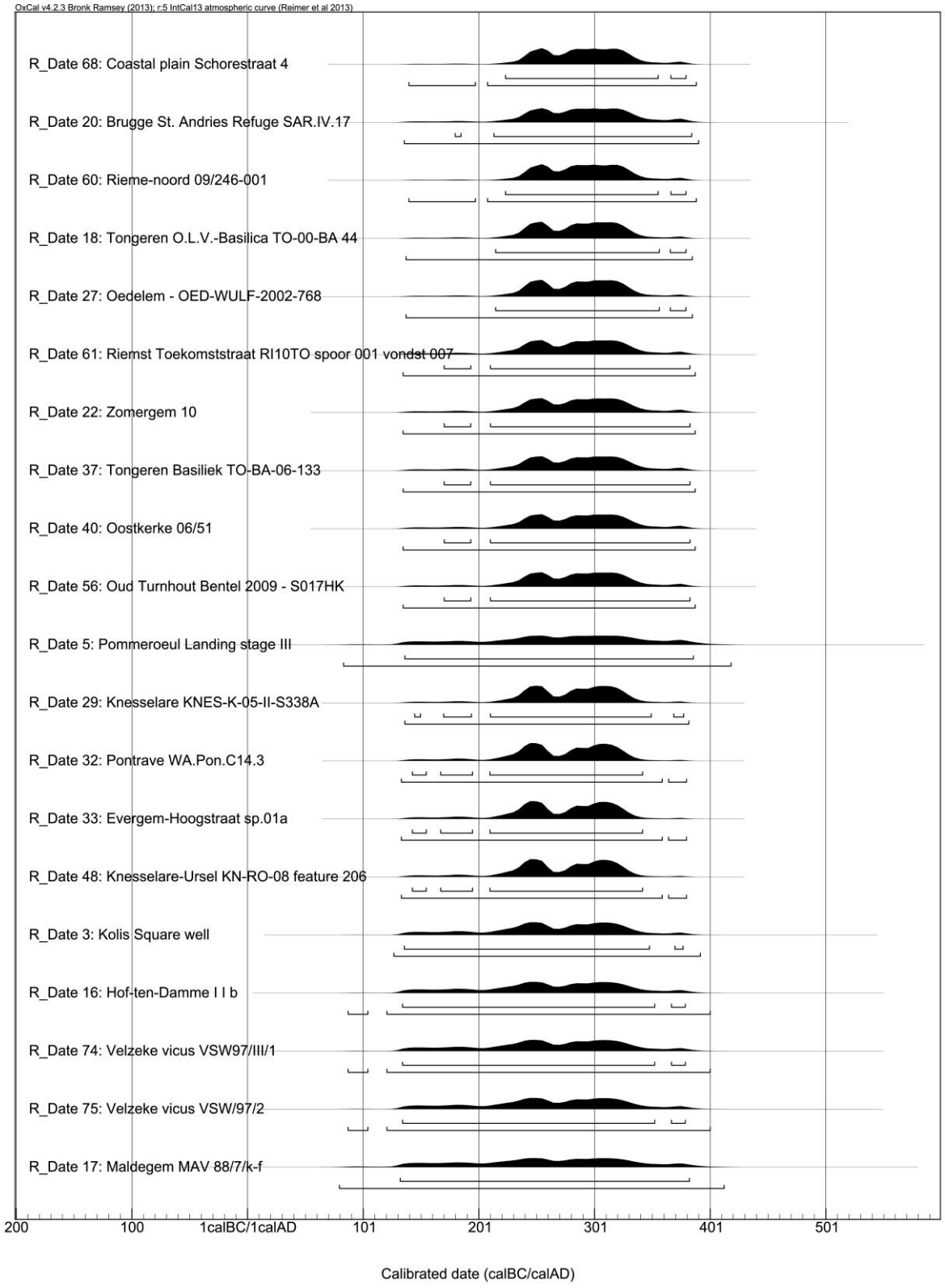
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R_Date 27: Oedelem - OED-WULF-2002-768
R_Date 61: Riemst Toekomststraat RI10TO spoor 001 vondst 007
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R_Date 37: Tongeren Basiliek TO-BA-06-133
R_Date 40: Oostkerke 06/51
R_Date 56: Oud Turnhout Bentel 2009 - S017HK
R_Date 5: Pommeroeul Landing stage III
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R_Date 32: Pontrave WA.Pon.C14.3
R_Date 33: Evergem-Hoogstraat sp.01a
R_Date 48: Knesselare-Ursel KN-RO-08 feature 206
R_Date 3: Kolis Square well
R_Date 16: Hof-ten-Damme I I b
R_Date 74: Velzeke vicus VSW97/III/1
R_Date 75: Velzeke vicus VSW/97/2
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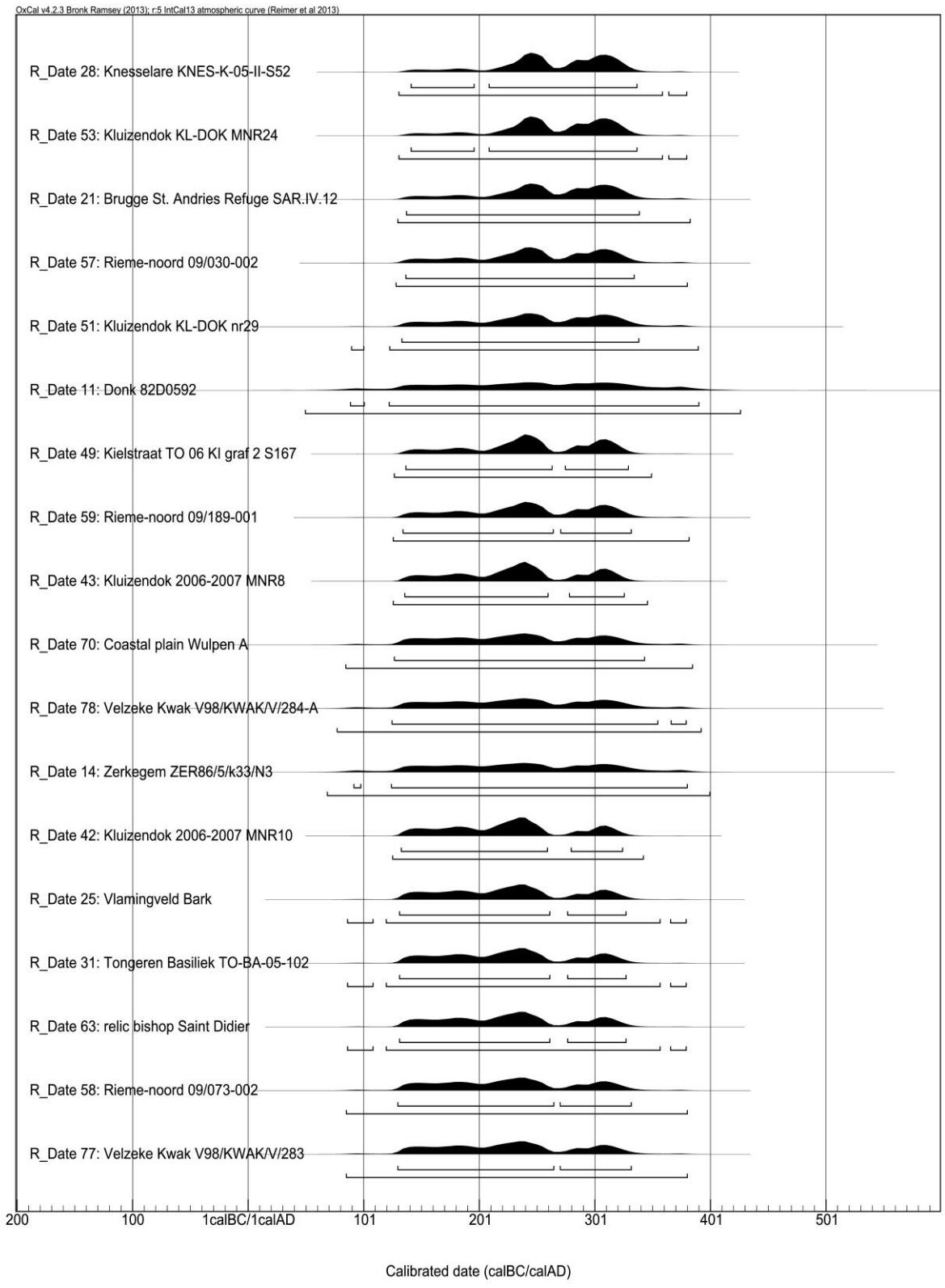
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R_Date 11: Donk 82D0592
R_Date 49: Kielstraat TO 06 KI graf 2 S167
R_Date 59: Rieme-noord 09/189-001
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R_Date 70: Coastal plain Wulpen A
R_Date 78: Velzeke Kwak V98/KWAK/V/284-A
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R_Date 42: Kluizendok 2006-2007 MNR10
R_Date 25: Vlamingveld Bark
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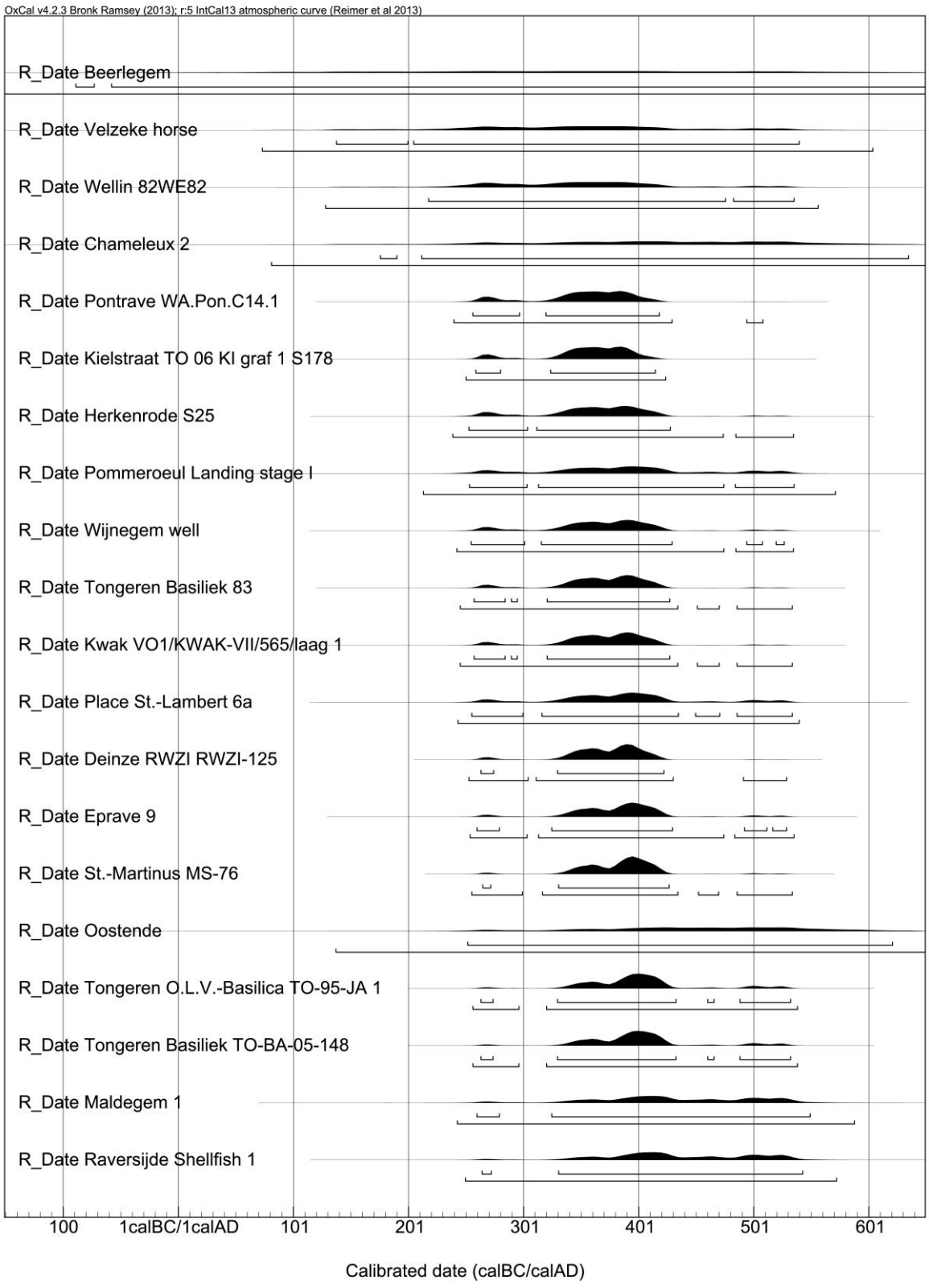
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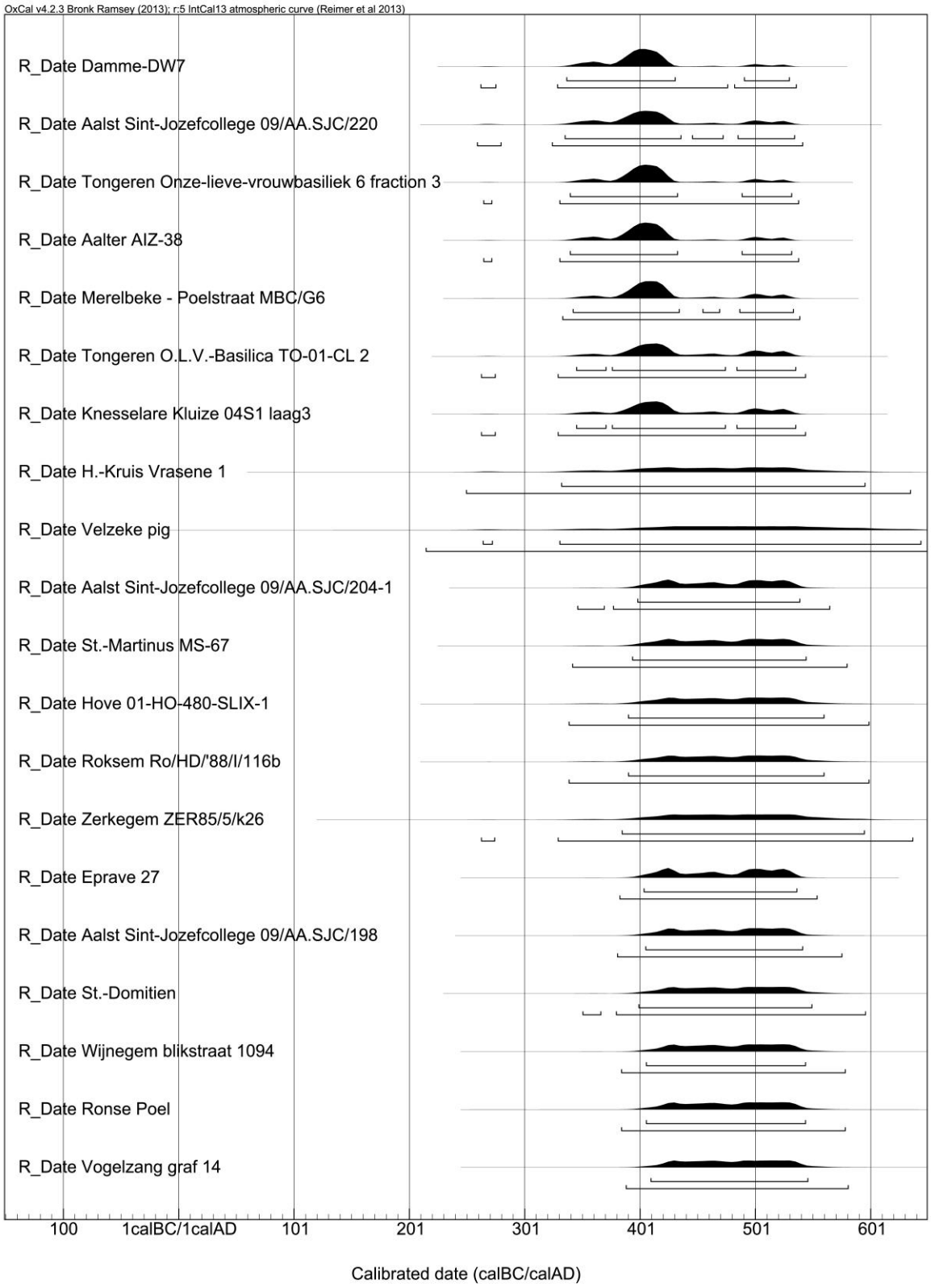
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R_Date Tongeren O.L.V.-Basilica TO-01-CL 2
R_Date Knesselare Kluize 04S1 laag3
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R_Date Velzeke pig
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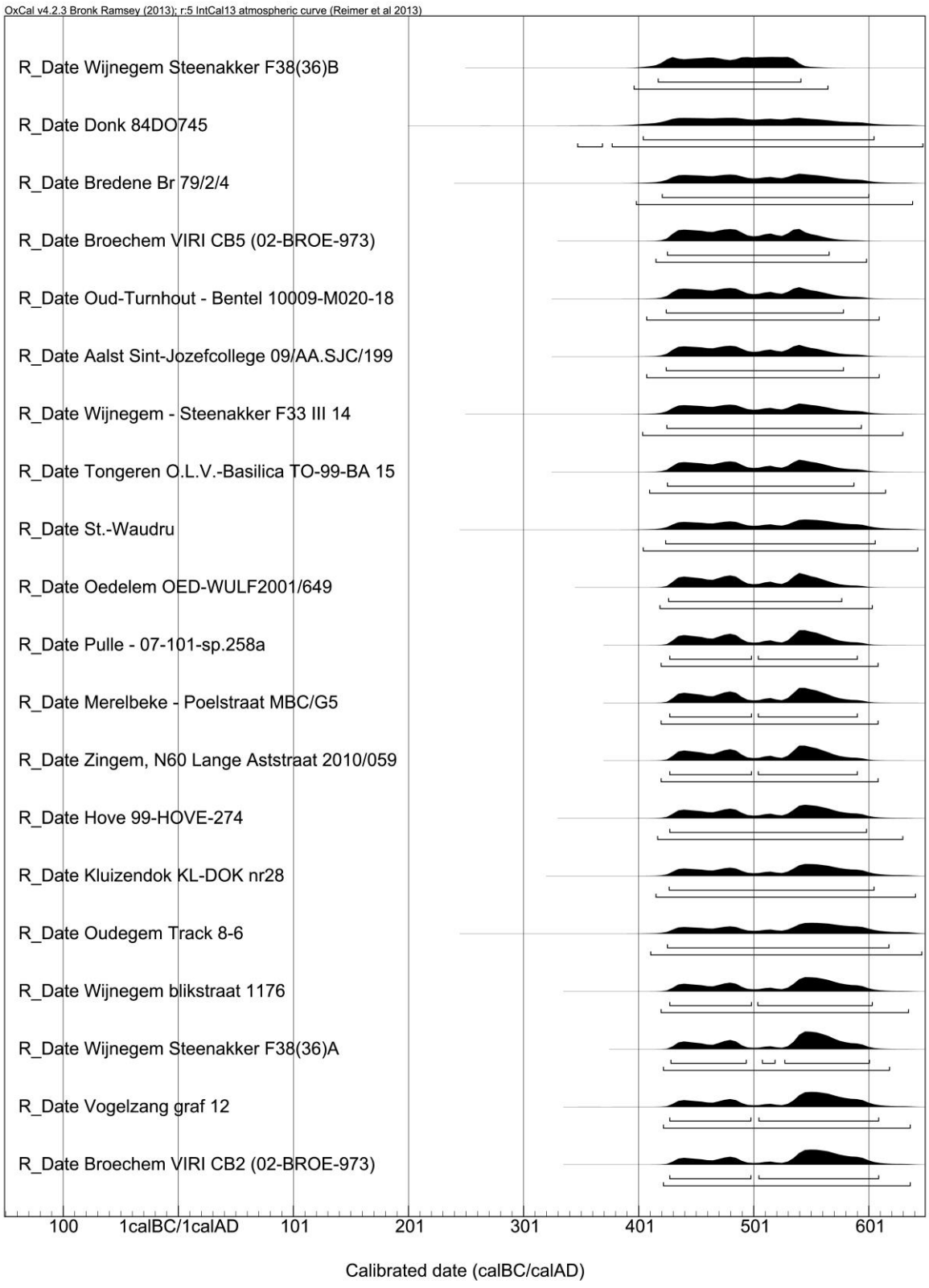
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R_Date Aalst Sint-Jozefcollege 09/AA.SJC/199
R_Date Wijnegem - Steenakker F33 III 14
R_Date Tongeren O.L.V.-Basilica TO-99-BA 15
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R_Date Oedelem OED-WULF2001/649
R_Date Pulle - 07-101-sp.258a
R_Date Merelbeke - Poelstraat MBC/G5
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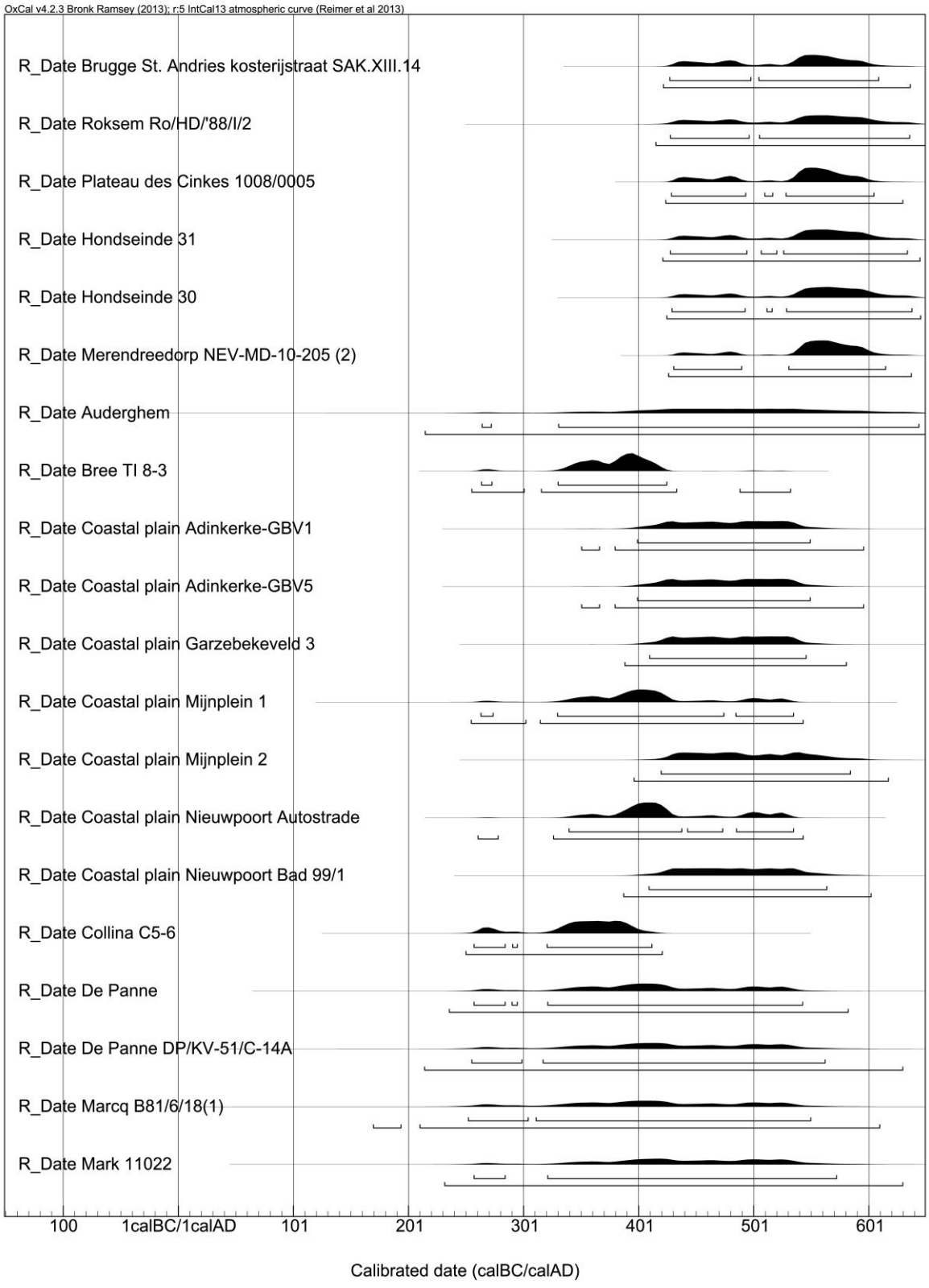
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R_Date Auderghem
R_Date Bree TI 8-3
R_Date Coastal plain Adinkerke-GBV1
R_Date Coastal plain Adinkerke-GBV5
R_Date Coastal plain Garzebekeveld 3
R_Date Coastal plain Mijnplein 1
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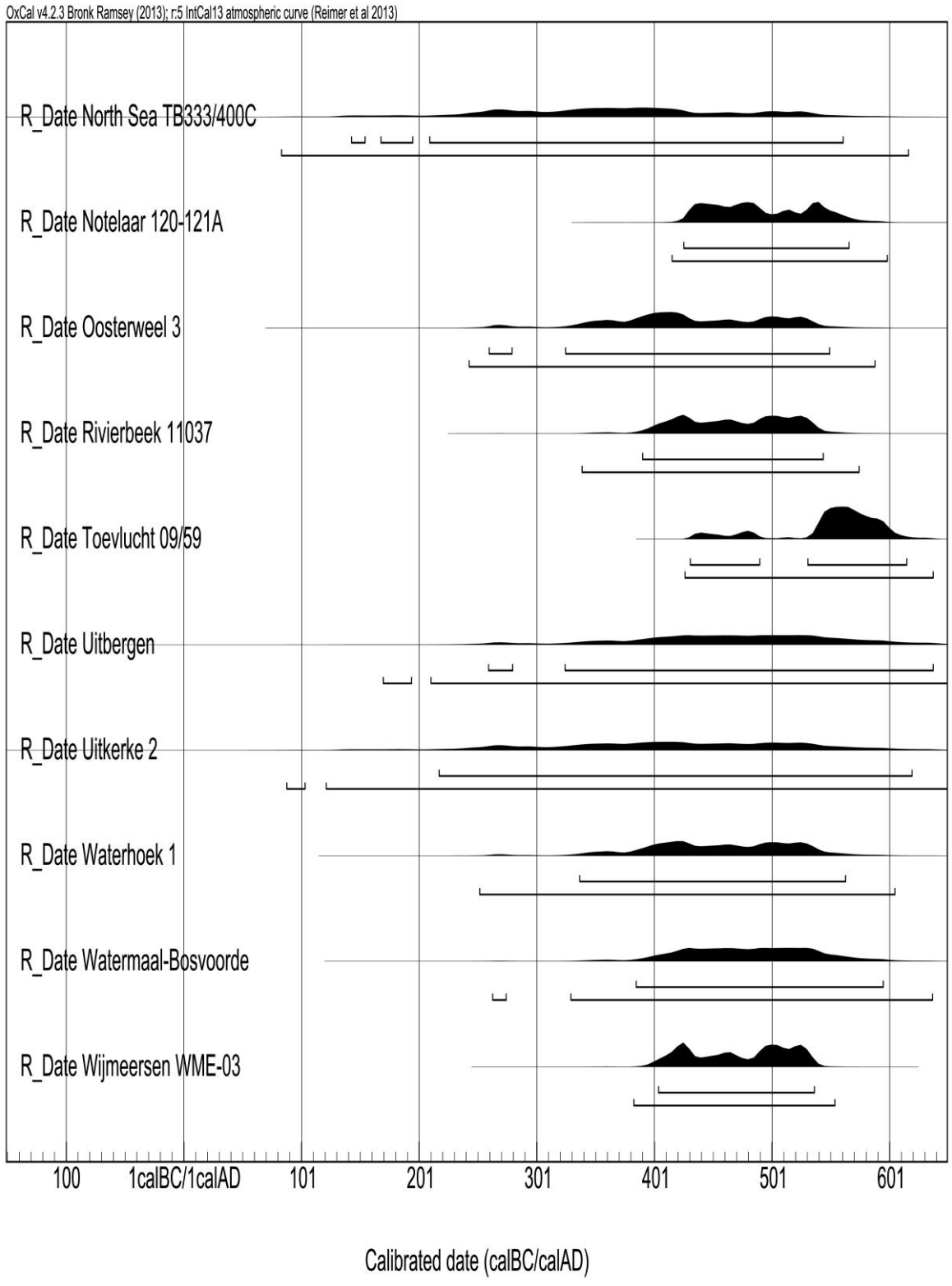
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R_Date Uitbergen
R_Date Uitkerke 2
R_Date Waterhoek 1
R_Date Watermaal-Bosvoorde
R_Date Wijmeersen WME-03
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Appendix 2:
On Late Roman Handmade pottery from Flanders and Northern Gaul

This appendix provides additional information on the Late Roman Handmade pottery discussed in Chapter 6. First a simplified petrographic classification table on the sampled handmade pottery from the Low Countries is given. Next the context information from the Flemish samples is presented. At the end the list containing the interregional inventory of Late Roman handmade pottery that has been studied by petrographic analyses from Belgium, the Netherlands, Germany and France can be found.

Petrographic classification

The following petrographic classification table contains the general observations and schematic descirptions from the thin sections according to the classification system presented in Chapter 6 (Goemaere – Van Thienen).

Legend:

F = fine, M = medium coarse, C = coarse

S = sorted, U = unsorted

-- = very few, - = sparse, * = common, + = rich, ++ = abundant

O = ore, A/P = amphiboles/pyroxenes (dark minerals), Z = zircon, Mu = muscovite, Bi = biotite, Iso = isotropic material, cp = clay pellets, Fs = feldspars, Fe = iron

Nat = natural, hom = homogeneous, het = heterogeneous

LR HM	SITE	DESCR.	P 1	P2 /1	P2 /2	P2 /3	M HG	M LG	V 1	V 2	V 3	S	G	B	PL	O	Q	SH	MU	BI	RE	OTHER FEATURES	NOTE
1	Lummen - Meldert - Zelemsebaan	MLG/Sqm?						1?				2					3		*			turmaline	inclusion resembling macquenoise (arkose) (3PPL)
2	Lummen - Meldert - Zelemsebaan	Sq/MLG?						?				1	?	?			2		*			Fs, chert, Fe rich	
3	Lummen - Meldert - Zelemsebaan	Sqg										2	3				1		*			Fs, chert, organic	
4	Lummen - Meldert - Zelemsebaan	MLG						1									2		-		-	chert, slate, dark minerals	combination high evoluted sedimentary and low metamorphic rocks

5	Lummen - Meldert - Zelemsebaan	MLG/Sqm?				1?							2				chert	
6	Lummen - Meldert - Zelemsebaan	V3sq					?	1	3	*			2		*		micaflakes	resembles micacious clay from LRTN (1A1)
7	Lummen - Meldert - Zelemsebaan	V2q					1						2		-			
8	Lummen - Meldert - Zelemsebaan	Sqg (Fe)								2			1				Fs, chert, Fe+, micaflakes	Fe = slag/FeO(OH)?
9	Lummen - Meldert - Zelemsebaan	Sq (Fe)							1				2				Fe+, chert	
10	Lummen - Meldert - Zelemsebaan	Sq (MLG?)				?			1				2		*	*	Fs, chert	
11	Lummen - Meldert - Zelemsebaan	V3sq						1	2	?			3				Fe rich	
12	Zele - Kamershoek	V1P2/3sq			2			1	*				3		*	*	Am, hornblende, chert	
13	Zele - Kamershoek	Plq/Sqpl									1		2		3		micaflakes	
14	Sint-Martens-Latem - Brakel - Torenhuis	P2/1	1										-		-	+	Fs, org, Fe, Am	DP&VI group A; matrix deforment = poor clay preparation
15	Sint-Martens-Latem - Brakel - Torenhuis	Sqb								2			1		-		chert, Fe	
16	Sint-Martens-Latem - Brakel - Torenhuis	Sqo							2	?	*	1	3					slag content: crystalized metal rich in iron (Fayolite and Würstile) = real slag temper (≠Ou)
17	Sint-Martens-Latem - Brakel - Torenhuis	Sqpl									1		2				Fe+, chert	FeO(OH)?
18	Sint-Martens-Latem - Brakel - Torenhuis	Sqpl									1		2		-			
19	Sint-Martens-Latem - Brakel - Torenhuis	Sqg								2			1				Fe, Fs, cp?	coarse Quartz grains = sand, vitrified grog; crucible?; fired at high temperature
20	Hasselt - Kuringen -	Sq											1				Fe, cp	

	Rode Rokstraat																		
21	Hasselt Kuringen Rode Rokstraat	-	V2s(q)					1	2	*			3				Fe, dark minerals	vitrified grog; volcanic and sedimentary inclusions, linked to Eifel?; sandstone = Quartzite
22	Hasselt Kuringen Rode Rokstraat	-	Sqg							2	*		1				cp+	
23	Hasselt Kuringen Rode Rokstraat	-	Sq						1			*	2					very rounded Q
24	Hasselt Kuringen Rode Rokstraat	-	MLG		?	1			*				2				Fs	Q with elongated grain < highly metamorphoc rock (source not in BE, possibly Taunus massive)
25	Hasselt Kuringen Rode Rokstraat	-	MLG/Sq?			1			2		?		3				Fe+, Fs?, org?	
26	Hasselt Kuringen Rode Rokstraat	-	MLG/Sq?			1			2				3				Fs, Fe, org?	
27	Hasselt Kuringen Rode Rokstraat	-	P2/2 (Sq)	1					2			*	3	*			Fs+	combination magmatic and sedimentary rocks
28	Knesselare Kouter	-	Gq							1			2				cp, Fe, org	microcrystaline Q?; micacious clay resembling LRTN 1A
29	Knesselare Kouter	-	Gq							1		*	2	-				vitrified grog
30	Knesselare Kouter	-	Sq(g)							2		*	1				cp+, chert/siltstone	vitrified grog, burned plant/charcoal, siltstone ~ semiplastic
31	Knesselare Kouter	-	Sqg						2	3		*	1				cp+, Fe, org	
32	Knesselare Kouter	-	Sq						1			*	2				cp, Fe, org, Fs?	
33	Oudenburg Spegelaere	-	Gq (re)							1		*	2			*	cp, silstone/grainstone?	vtirfied grog of different composition/quality
34	Oudenburg Spegelaere	-	G (cp/re)							1		*				*	cp, Fe	vitrified grog
35	Oudenburg Spegelaere	-	Sq						1				2				cp, Fs, chert/silstone?	

36	Oudenburg - Spegelaere	V2sqca			1		2	*			3					chert, limestone, bioclastic grainstone	ghost fossils; 2 Q populations (rounded Q from limesone carbonate, angular Q from fociliferous limestone) => 2 ≠ sources
37	Oudenburg - Spegelaere	Sgre					1	2							3		vitrified grog with metallic substance (crucible?), indications grog inclusions belongs to group DP-VI A
38	Oudenburg - Spegelaere	Sqcag					1	2							*	cp, limestone, org	
39	Oudenburg - Spegelaere	Sqg (re)					1	3			2				*	cp, glauconite	clay lumps from dried clay grog?
40	Oudenburg - Spegelaere	Sqg (re)					1	3			2		-		*	cp, chert, Fs, org/Fe?	
41	Oudenburg - Spegelaere	V2sqca (g)			1		2	*			3		-			limestone (ca)	highly vitrified grog fragment (crucible, slag grog?), oids ghosts
42	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	cp, Fe	
43	Oudenburg - Spegelaere	Sqg (re)					1	3			2				*	cp, Fe	
44	Oudenburg - Spegelaere	Sq					1				2					chert, cp	
45	Oudenburg - Spegelaere	Sqg (re)					1	3			2				*	cp, Fe, Fs	
46	Oudenburg - Spegelaere	Sq (O?)					1		*	?	2		*				glassy substance in pores: metallic or preparation left over?
47	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	cp, Fe	finer quality
48	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	cp	
49	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	cp, Fs	
50	Oudenburg - Spegelaere	Sq					1	?			2		-			Fs, chert/silt rich incl, Fe, org, Am?	
51	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	Fe, cp	
52	Oudenburg - Spegelaere	Sshq / Shsq				1					3	2				limestone	limestone: crushed fossiliferous grainstone, fired below 850°C
53	Oudenburg - Spegelaere	MLG		1				*		*			*		*		partly vitrified matrix: 2 different heatings, highly evoluted sandstone (=MLG)
54	Oudenburg - Spegelaere	Sqg					1	3 ?			2					cp, chert	
55	Oudenburg - Spegelaere	Sqg (re)					1	2	*		3				*	chert, Fe	
56	Oudenburg - Spegelaere	Sqg (re)					1	3	*		2				*	cp, Fe	

57	Oudenburg - Spegelaere	Sqg (re)				1				2			3	siltstone	vitrified ceramics with 'glossy' properties
58	Oudenburg - Spegelaere	Sqg (re)				1	3		*	2			*	cp+, chert	
59	Oudenburg - Spegelaere	Sq							*	1				Fs	bad polishing of thin section (too much)
60	Oudenburg - Spegelaere	Sqg (re)				1	2		*	3				Fe	vitrified grog
61	Mortsel - Steenakker	V3 (sq)			1	2	?		*	3		-			maybe combination volcanic and plutonic source, Q and sandstone are dominant
62	Mortsel - Steenakker	Sqg				1	3 ?			2				Fe, dark minerals, org	arkosic origin?
63	Turnhout - Tijl-en-Nelestraat	Sqg				1	3			2					fine matrix
64	Turnhout - Tijl-en-Nelestraat	Gq					1			2		*		chert	DP&VI group E; possible local production, no evidence otherwise
65	Turnhout - Tijl-en-Nelestraat	Sq				1				2				Fe	possible local production, no evidenice pointing to non-local production or origin
66	Turnhout - Tijl-en-Nelestraat	Sqg				1	2			3				cp	
67	Turnhout - Tijl-en-Nelestraat	Sq				1				2		*		cp, Fe, chert	
68	Nazareth - Eke - 's Gravendreef	Sqb						2		1		*	?	organic mat, micaflakes	organic: wood/plant/charcoal?; different colour phases in bone material
69	Nazareth - Eke - 's Gravendreef	Gq					1		*	2		-		cp, Fe, Fs	grog in grog
70	Zele - Kamershoek	Sqpl				2			1	3			*	Fe	well sorted, bimodel?
71	Lanaken - Neerharen-Rekem	V3q			1					2					polycrystaline Q are irregular and angular: crushed or short transport?; combination volcanic and sedimentary
72	Lanaken - Neerharen-Rekem	MLG/Sq?		?		1				2					
73	Lanaken - Neerharen-Rekem	Sqca/Shsq(ca)				2	*		*	3	1			Fe, org (B/Pl?), limestone	

74	Lanaken - Neerharen-Rekem	Sq					1					2					Fe, org	very coarse Q: granule/pebble
75	Lanaken - Neerharen-Rekem	SqO					1	*			3	2						
76	Lanaken - Neerharen-Rekem	V1sq			1		2					3						
77	Tiel - Medel	Sshq/Shsq					2					3	1					mix of angular and rounded shells = crushed from fresh, no limestone; only 1 shell species? = artificial selection (~eating)
78	Tiel - Passewaaij	Sq					1					2					siltstone/sandstone, cp, Fs	
79	Beneden Leeuwen - De Ret	Bqm							1			2					Fs	crushed fresh bone, small fragments of sandstone: Q from metamorphic rocks, very fine micarich matrix
80	Wehl - Hessenveld	Sq (Fe)					1	*		*		2					Fe+, limestone/fossil, cp	1 grog grain
81	Wehl - Hessenveld	Bq							1			2					micaflakes	possibly on the limit of low grade metamorphic, although structure of Q is not supportive
82	Tiel - Passewaaij	Sq					1					2					Fs, Am?	
83	Tiel - Passewaaij	V3sq (ca)				1	2					3					limestone	
84	Tiel - Passewaaij	V3sq				1	2					3					Fe	
85	Tiel - Passewaaij	Shsq/Sshq					2	?				3	1				limestone, Fs, chert	
86	Ressen/Bemmel - De Kerkenhof	Sq (sh)					1			*		2	*	-			Fe	
87	Harlingen - Wijnaldum	Sq								*		-		-			Fs	
88	Harlingen - Wijnaldum	Plq/Sqpl								+							cp	
89	Tynaarlo - Midlaren	P2/3mu(bi)		1								3		2	*			possible bimodality of sedimentary (Q, Mu) and magmatic (Fs, Bi) source (~granitic?)
90	Midden-Drenthe - Wijster	P2/3mu(bi)		1								3		2	*			complex grains (Fs, Q, Mu, A)
91	Breda – Steenakker	Gqb						1	3			2						

Context information

List of context information for each Late Roman handmade sherd analysed by ceramic petrography in Flanders.

LRHM	Site	Class (G-VT)	Group (DP-VI)	Context	Description	Date (AD)	Note
1	Lummen - Meldert - Zelemsebaan	S/M	D/A	sp597.5	watering place for live stock	350 425	likely 5th century date
2	Lummen - Meldert - Zelemsebaan	S/M	D/A	sp597.1	watering place for live stock	350 425	likely 5th century date
3	Lummen - Meldert - Zelemsebaan	S G	E	sp597.2	watering place for live stock	350 425	likely 5th century date
4	Lummen - Meldert - Zelemsebaan	M	A	sp597.2	watering place for live stock	350 425	likely 5th century date
5	Lummen - Meldert - Zelemsebaan	S/M	D/A	sp597.3	watering place for live stock	350 425	likely 5th century date
6	Lummen - Meldert - Zelemsebaan	V	B	sp597.3	watering place for live stock	350 425	likely 5th century date
7	Lummen - Meldert - Zelemsebaan	V	B	sp597.3	watering place for live stock	350 425	likely 5th century date
8	Lummen - Meldert - Zelemsebaan	S G	E	sp597.3	watering place for live stock	350 425	likely 5th century date
9	Lummen - Meldert - Zelemsebaan	S	D	sp597.13	watering place for live stock	350 425	potentialy earlier date
10	Lummen - Meldert - Zelemsebaan	S/M	D/A	sp520	ditch	300 500	imitation LRTN in HM
11	Lummen - Meldert - Zelemsebaan	V	B	sp439	posthole/natural feature	300 400	HM with slow turning finish
12	Zele - Kamershoek	V	B	zkh113	pool/pond	200 300	"Frisian" sherd possibly 250-350

13	Zele - Kamershoek	S	PL	D	zkh447	pit	200	300	likely 2nd half 3rd century
14	Sint-Martens-Latem - Brakel - Torenhuis	P	L	A	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
15	Sint-Martens-Latem - Brakel - Torenhuis	S	B	C	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
16	Sint-Martens-Latem - Brakel - Torenhuis	S	O	D	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
17	Sint-Martens-Latem - Brakel - Torenhuis	S	PL	D	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
18	Sint-Martens-Latem - Brakel - Torenhuis	S	PL	D	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
19	Sint-Martens-Latem - Brakel - Torenhuis	S	G	E	90	pit in sunken hut	350	450	preference to 375-425 (Vermeulen 1989)
20	Hasselt - Kuringen - Rode Rokstraat	S		D	KL52	pit in house	350	500	likely 2nd half 4th century, start 5th
21	Hasselt - Kuringen - Rode Rokstraat	V	L	B	KL52	pit in house	350	500	likely 2nd half 4th century, start 5th
22	Hasselt - Kuringen - Rode Rokstraat	S	G	E	KL65	pit	350	500	likely 2nd half 4th century, start 5th
23	Hasselt - Kuringen - Rode Rokstraat	S		D	KL05	pit in house (Wijster AII)	350	500	likely 2nd half 4th century, start 5th
24	Hasselt - Kuringen - Rode Rokstraat	M		A	KL05	pit in house (Wijster AII)	350	500	likely 2nd half 4th century, start 5th
25	Hasselt - Kuringen - Rode Rokstraat	M		A	KL31	pit	350	500	likely 2nd half 4th century, start 5th

26	Hasselt - Kuringen - Rode Rokstraat		M		A	KL31	pit	350	500	likely 2nd half 4th century, start 5th
27	Hasselt - Kuringen - Rode Rokstraat		P		A	HS05	posthole house (Wijster B)	350	500	likely 2nd half 4th century, start 5th
28	Knesselare - Kouter		S	G	E	52	corner posthole palisade	225	325	associated with 3rd century ceramics
29	Knesselare - Kouter		S	G	E	338	posthole for heavy post from gate tower A	235	325	associated with 3rd century ceramics
30	Knesselare - Kouter		S	G	E	100	pit inside palisade	200	325	predominating activities in 3rd century
31	Knesselare - Kouter		S	G	E	100	pit inside palisade	200	325	predominating activities in 3rd century
32	Knesselare - Kouter		S		D	101	pit inside palisade (heavy post?)	200	325	predominating activities in 3rd century
33	Oudenburg - Spegelaere		S	G	E	4923	fill inside timber	325	425	predominating in the 4th century, no firm end date
34	Oudenburg - Spegelaere		S	G	E	4923	fill inside timber	325	425	predominating in the 4th century, no firm end date
35	Oudenburg - Spegelaere		S		D	4923	fill inside timber	325	425	predominating in the 4th century, no firm end date
36	Oudenburg - Spegelaere		V		B	4923	fill inside timber	325	425	predominating in the 4th century, no firm end date
37	Oudenburg - Spegelaere		S	G	E	4923	outside timber	?	?	thought to be post-Roman
38	Oudenburg - Spegelaere		S	G	E	4923	outside timber	?	?	thought to be post-Roman
39	Oudenburg - Spegelaere		S	G	E	8670	pit	250	300	2nd half 3rd century, although associated with a BB1 resemblance: 4th century
40	Oudenburg - Spegelaere		S	G	E	8670	pit	250	300	2nd half 3rd century, although associated with a

										BB1 resemblance: 4th century
41	Oudenburg Spegelaere	-	V		B	8670	pit	250	300	2nd half 3rd century, although associated with a BB1 resemblance: 4th century
42	Oudenburg Spegelaere	-	S	G	E	8924A/10908	pit	325	425	much intrusions, mainly 4th century context
43	Oudenburg Spegelaere	-	S	G	E	8924A/10908	pit	325	425	much intrusions, mainly 4th century context
44	Oudenburg Spegelaere	-	S		D	8924A/10908	pit	325	425	much intrusions, mainly 4th century context
45	Oudenburg Spegelaere	-	S	G	E	7200	?	?	?	
46	Oudenburg Spegelaere	-	S		D	7200	?	?	?	
47	Oudenburg Spegelaere	-	S	G	E	44940 V	secundary fill pit	325	425	
48	Oudenburg Spegelaere	-	S	G	E	44940 V	secundary fill pit	325	425	
49	Oudenburg Spegelaere	-	S	G	E	2951	pit	325	425	
50	Oudenburg Spegelaere	-	S		D	2951	pit	325	425	
51	Oudenburg Spegelaere	-	S	G	E	2562	double well	260	410	ceramics are mainly 4th century
52	Oudenburg Spegelaere	-	V	SH	B	2562	double well	260	410	ceramics are mainly 4th century
53	Oudenburg Spegelaere	-	M		A	2562	double well	260	410	ceramics are mainly 4th century
54	Oudenburg Spegelaere	-	S	G	E	4980I	secundary fill pit	400	500	fase 6 is post-Roman, associated with BB1-ceramics from 3rd and 4th century
55	Oudenburg Spegelaere	-	S	G	E	4980I	secundary fill pit	400	500	fase 6 is post-Roman, associated with BB1-ceramics

									from 3rd and 4th century
56	Oudenburg - Spegelaere	S	G	E	4980I	secundary fill pit	400	500	fase 6 is post-Roman, associated with BB1-ceramics from 3rd and 4th century
57	Oudenburg - Spegelaere	S	G	E	4980I	secundary fill pit	400	500	fase 6 is post-Roman, associated with BB1-ceramics from 3rd and 4th century
58	Oudenburg - Spegelaere	S	G	E	4980I	secundary fill pit	400	500	fase 6 is post-Roman, associated with BB1-ceramics from 3rd and 4th century
59	Oudenburg - Spegelaere	S		D	7949	brooch production waste pit	260	280	fase 4 with 3rd century sprung brooches
60	Oudenburg - Spegelaere	S	G	E	7949	brooch production waste pit	260	280	fase 4 with 3rd century sprung brooches
61	Mortsel - Steenakker	V		B	4	Pit (suspected sunken hut)	200	400	suspected 4th century, difficult to confirm
62	Mortsel - Steenakker	S	G	E	4	Pit (suspected sunken hut)	200	400	suspected 4th century, difficult to confirm
63	Turnhout - Tijl-en-Nelestraat	S	G	E	sp956	posthole house 7	220	390	associated with late 2nd-3rd century material
64	Turnhout - Tijl-en-Nelestraat	S	G	E	sp963	posthole house 7	220	390	associated with late 2nd-3rd century material
65	Turnhout - Tijl-en-Nelestraat	S		D	sp643	pit interior house 8	230	390	associated with 3rd century material
66	Turnhout - Tijl-en-Nelestraat	S	G	E	sp616	posthole house 8	230	390	associated with 3rd century material
67	Turnhout - Tijl-en-Nelestraat	S		D	sp625	posthole heavy post house 8	230	390	14C from this posthole, MC 3rd century
68	Nazareth - Eke - 's Gravendreef	S	B	C	sp32	posthole inside house 3	210	340	date by 14C, possible Wijster A house

69	Nazareth - Eke - 's Gravendreef	S	G	E	sp81	pit	*	*	details not yet known
70	Zele - Kamershoek	S	PL	D	?	pit	200	300	
71	Lanaken - Neerharen-Rekem	V		B	81-NE-66	pit	?	?	thought of as Iron Age: not recognised Germanic LR?
72	Lanaken - Neerharen-Rekem	S/M		D/A	81-NE-142	hearth assemblage	?	?	uncertain initial determination Iron Age or Roman: not recognised Germanic LR?
73	Lanaken - Neerharen-Rekem	S	SH	C	84-RE-55	sunkent hut feature S301	360	450	sunken hut dated to 360-450, preference for 380-450 based on numismatic evidence
74	Lanaken - Neerharen-Rekem	S		D	84-RE-55	sunkent hut feature S301	360	450	sunken hut dated to 360-450, preference for 380-450 based on numismatic evidence
75	Lanaken - Neerharen-Rekem	S	O	D	84-RE-67	sunken hut 5	360	450	sunken hut dated to 360-450, preference for 380-450 based on numismatic evidence
76	Lanaken - Neerharen-Rekem	V		B	84-RE-147	sunken hut 11	360	450	sunken hut dated to 360-450, preference for 380-450 based on numismatic evidence

Thin sections from Northern Gaul

List of 4th and 5th century Late Roman Handmade pottery from Belgium, the Netherlands, northwest Germany and north France (datasets of G-VT, DP-VI, D-O, B-TL-L). All uncertain and earlier/later dated sherds were removed.

C	Study	Site	Context	ID	DP-VI Group	G-VT Class	
BE	DP-VI	Asper		1	A	PM	
BE	DP-VI	Donk		6	A	PM	
BE	DP-VI	Donk		12	A	PM	
BE	DP-VI	Donk		13	A	PM	
BE	DP-VI	Donk		15	A	PM	
BE	DP-VI	Donk		22	A	PM	
BE	DP-VI	Donk		25	A	PM	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	MLG	24	A	M	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	MLG/Sq?	25	A	M	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	MLG/Sq?	26	A	M	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	P2/2 (Sq)	27	A	P	
BE	DP-VI	Kontich		26	A	PM	
BE	G-VT	Lanaken - Neerharen-Rekem	MLG/Sq?	72	A	S/M	
BE	G-VT	Lummen - Meldert - Zelemsebaan	MLG	4	A	M	
BE	G-VT	Lummen - Meldert - Zelemsebaan	MLG/Sqm?	1	A	S/M	
BE	G-VT	Lummen - Meldert - Zelemsebaan	Sq/MLG?	2	A	S/M	
BE	G-VT	Lummen - Meldert - Zelemsebaan	MLG/Sqm?	5	A	S/M	
BE	G-VT	Lummen - Meldert - Zelemsebaan	Sq (MLG?)	10	A	S/M	
BE	D-O	Maaseik-Aldeneik	706/k4	LO24	A	PM	
BE	DP-VI	Montaigle	AR 4335	194	A	PM	
BE	G-VT	Oudenburg - Spegelaere	MLG	53	A	M	
BE	DP-VI	Sint-Martens-Latem		34	A	PM	
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	P2/1	14	A	P	L
BE	DP-VI	Virton		41	A	PM	
BE	D-O	Zele		LO28	A	PM	
DE	DP-VI	Emmerich-Praest	AR 3839	174	A	PM	
DE	DP-VI	Fedderesen Wierde		90	A	PM	
DE	DP-VI	Fedderesen Wierde		91	A	PM	
DE	DP-VI	Fedderesen Wierde		92	A	PM	
DE	DP-VI	Fedderesen Wierde		93	A	PM	
DE	DP-VI	Fedderesen Wierde		94	A	PM	
DE	DP-VI	Fedderesen Wierde		95	A	PM	
DE	DP-VI	Fedderesen Wierde		96	A	PM	
DE	DP-VI	Fedderesen Wierde		97	A	PM	
DE	DP-VI	Fedderesen Wierde		98	A	PM	
DE	DP-VI	Fedderesen Wierde		99	A	PM	

DE	DP-VI	Fedderesen Wierde		100	A	PM
DE	DP-VI	Fedderesen Wierde		101	A	PM
DE	DP-VI	Fedderesen Wierde		102	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		103	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		106	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		109	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		112	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		105	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		108	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		111	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		114	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		104	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		107	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		110	A	PM
DE	DP-VI	Flögeln-Eckhöltjen		113	A	PM
DE	DP-VI	Gristede		115	A	PM
DE	DP-VI	Gristede		118	A	PM
DE	DP-VI	Gristede		117	A	PM
DE	DP-VI	Gristede		120	A	PM
DE	DP-VI	Gristede		116	A	PM
DE	DP-VI	Gristede		119	A	PM
DE	DP-VI	Hiddenhausen-Oetingausen	AR 4332	191	A	PM
DE	DP-VI	Hiddenhausen-Oetingausen	AR 4333	192	A	PM
DE	DP-VI	Lintig		121	A	PM
DE	DP-VI	Lintig		124	A	PM
DE	DP-VI	Lintig		127	A	PM
DE	DP-VI	Lintig		130	A	PM
DE	DP-VI	Lintig		123	A	PM
DE	DP-VI	Lintig		126	A	PM
DE	DP-VI	Lintig		129	A	PM
DE	DP-VI	Lonxstedt		133	A	PM
DE	DP-VI	Lonxstedt		136	A	PM
DE	DP-VI	Lonxstedt		139	A	PM
DE	DP-VI	Lonxstedt		142	A	PM
DE	DP-VI	Lonxstedt		132	A	PM
DE	DP-VI	Lonxstedt		135	A	PM
DE	DP-VI	Lonxstedt		138	A	PM
DE	DP-VI	Lonxstedt		141	A	PM
DE	DP-VI	Lonxstedt		131	A	PM
DE	DP-VI	Lonxstedt		134	A	PM
DE	DP-VI	Lonxstedt		137	A	PM
DE	DP-VI	Lonxstedt		140	A	PM
DE	DP-VI	Mahlstedt		145	A	PM
DE	DP-VI	Mahlstedt		148	A	PM
DE	DP-VI	Mahlstedt		144	A	PM
DE	DP-VI	Mahlstedt		147	A	PM

DE	DP-VI	Mahlstedt		143	A	PM	
DE	DP-VI	Mahlstedt		146	A	PM	
DE	DP-VI	Mahlstedt		149	A	PM	
DE	DP-VI	Midlun-Northum		151	A	PM	
DE	DP-VI	Midlun-Northum		154	A	PM	
DE	DP-VI	Midlun-Northum		157	A	PM	
DE	DP-VI	Midlun-Northum		150	A	PM	
DE	DP-VI	Midlun-Northum		153	A	PM	
DE	DP-VI	Midlun-Northum		156	A	PM	
DE	DP-VI	Midlun-Northum		159	A	PM	
DE	DP-VI	Midlun-Northum		152	A	PM	
DE	DP-VI	Midlun-Northum		155	A	PM	
DE	DP-VI	Midlun-Northum		158	A	PM	
DE	DP-VI	Ruhwarden		160	A	PM	
DE	DP-VI	Ruhwarden		163	A	PM	
DE	DP-VI	Ruhwarden		162	A	PM	
DE	DP-VI	Ruhwarden		161	A	PM	
DE	DP-VI	Rullstorf		166	A	PM	
DE	DP-VI	Rullstorf		169	A	PM	
DE	DP-VI	Rullstorf		165	A	PM	
DE	DP-VI	Rullstorf		168	A	PM	
DE	DP-VI	Rullstorf		164	A	PM	
DE	DP-VI	Rullstorf		167	A	PM	
FR	B-TL-L	Arras	D87-F00		A	M	
FR	B-TL-L	Bavay	Ba 91		A	M	
FR	B-TL-L	Bavay	Ba 91 - 51229		A	M	
FR	B-TL-L	Bavay	BA 90-00082		A	M	
NL	DP-VI	Dalfsen		87	A	PM	
NL	DP-VI	Dalfsen		88	A	PM	
NL	D-O	Ede-Veldhuizen	Ede 68 510/4	LO20	A	PM	
NL	DP-VI	Lintig		122	A	PM	
NL	DP-VI	Lintig		125	A	PM	
NL	DP-VI	Lintig		128	A	PM	
NL	G-VT	Midden-Drenthe - Wijster	P2/3mu(bi)	90	A	P	
NL	DP-VI	Oud-Leusden		76	A	PM	
NL	DP-VI	Oud-Leusden		78	A	PM	
NL	G-VT	Tynaarlo - Midlaren	P2/3mu(bi)	89	A	P	
NL	D-O	Wehl-Hessenveld	WH 11-13-6	LO26	A	PM	
NL	D-O	Wijk-bij-Duurstede/De Geer	792/7/7	LO23	A	PM	
BE	D-O	Achel	3590 005	LO22	B	V	
BE	G	Baelen-Nereth	V		B	V	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	V2s(q)	21	B	V	L
BE	D-O	Kerkhove	KER77/15bis/k1.2	LO18	B	V	
BE	G-VT	Lummen - Meldert - Zelemsebaan	V3sq	6	B	V	
BE	G-VT	Lummen - Meldert - Zelemsebaan	V2q	7	B	V	
BE	G-VT	Lummen - Meldert - Zelemsebaan	V3sq	11	B	V	

BE	D-O	Merendree			LO06	B	V	
BE	G-VT	Mortsel - Steenakker	V3 (sq)		61	B	V	
BE	G-VT	Neerharen-Rekem	V3q		71	B	V	
BE	G-VT	Neerharen-Rekem	V1sq		76	B	V	
BE	G-VT	Oudenburg - Spegelaere	Sshq / Shsq		52	B	V	SH
BE	G-VT	Oudenburg - Spegelaere	V2sqca		36	B	V	
BE	DP-VI	Virton			42	B	V	
BE	D-O	Zerkgem	ZER85/5/I1.3		LO10	B	V	
FR	B-TL-L	Izel	IZ IV			B	V	
FR	B-TL-L	Labuissiere	LI (3)			B	V	
FR	B-TL-L	Labuissiere	LI (5)			B	V	
FR	B-TL-L	Seclin	SF5(1B)			B	V	
NL	DP-VI	Ede-Veldhuizen			73	B	V	
NL	D-O	Gennep		2826	LO25	B	V	
NL	G-VT	Tiel - Passewaaij	V3sq (ca)		83	B	V	
NL	G-VT	Tiel - Passewaaij	V3sq		84	B	V	
NL	D-O	Wehl-Hessenveld	Whv96 14-2-44		LO17	B	V	
NL	D-O	Wehl-Hessenveld	WHv93 13-0		LO03	B	V	
NL	D-O	Wehl-Hessenveld	Whv24-2-3		LO13	B	V	
NL	D-O	Wijk-bij-Duurstede/De Geer		14712	LO07	B	V	
BE	DP-VI	Donk			18	C	S	B
BE	DP-VI	Donk			24	C	S	B
BE	G-VT	Nazareth - Eke - ‘s Gravendreef	Sqb		68	C	S	B
BE	DP-VI	Sint-Martens-Latem			35	C	S	B
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	Sqb		15	C	S	B
DE	DP-VI	Rees-Bergswick	AR 3842		177	C	S	B
NL	G-VT	Beneden Leeuwen - De Ret	Bqm		79	C	M	B
NL	D-O	Breda			LO29	C	S	B
NL	D-O	Breda			LO30	C	S	B
NL	D-O	Gennep		4533	LO01	C	S	B
NL	G-VT	Wehl - Hessenveld	Bq		81	C	S	B
NL	D-O	Wijk-bij-Duurstede/De Geer	805/4/77		LO04	C	S	B
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	Sq		20	D	S	
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	Sq		23	D	S	
BE	G-VT	Lummen - Meldert - Zelemsebaan	Sq (Fe)		9	D	S	
BE	G-VT	Neerharen-Rekem	SqO		75	D	S	O
BE	G-VT	Neerharen-Rekem	Sqca/Shsq(ca)		73	D	S	SH
BE	G-VT	Neerharen-Rekem	Sq		74	D	S	
BE	G-VT	Oudenburg - Spegelaere	Sq		35	D	S	
BE	G-VT	Oudenburg - Spegelaere	Sq		44	D	S	
BE	G-VT	Oudenburg - Spegelaere	Sq (O?)		46	D	S	
BE	G-VT	Oudenburg - Spegelaere	Sq		50	D	S	
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	Sqo		16	D	S	O
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	Sqpl		17	D	S	PL
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	Sqpl		18	D	S	PL
BE	G-VT	Turnhout - Tijl-en-Nelestraat	Sq		65	D	S	

BE	G-VT	Turnhout - Tijl-en-Nelestraat	Sq	67	D	S	
DE	DP-VI	Rees-Bergswick	AR 3840	175	D	S	
FR	B-TL-L	Arras	Prélecture		D	S	
FR	B-TL-L	Arras	A84-F15		D	S	
FR	B-TL-L	Arras	A84-F15		D	S	
FR	B-TL-L	Arras	C86-Q08		D	S	
FR	B-TL-L	Arras	A IV (6)		D	S	
FR	B-TL-L	Nouvion	T237		D	S	
FR	B-TL-L	Seclin	SF5(2)		D	S	
FR	B-TL-L	Seclin	S90(1)		D	S	G
FR	B-TL-L	Seclin	S90(2)		D	S	G
FR	B-TL-L	Seclin	S90(3)		D	S	
NL	G-VT	Harlingen - Wijnaldum	Sq	87	D	S	
NL	G-VT	Harlingen - Wijnaldum	Plq/Sqpl	88	D	S	
NL	G-VT	Ressen/Bemmel - De Kerkenhof	Sq (sh)	86	D	S	SH
NL	G-VT	Tiel - Medel	Sshq/Shsq	77	D	S	SH
NL	G-VT	Tiel - Passewaaij	Shsq/Sshq	85	D	S	SH
NL	G-VT	Tiel - Passewaaij	Sq	78	D	S	
NL	G-VT	Tiel - Passewaaij	Sq	82	D	S	
NL	G-VT	Wehl - Hessenveld	Sq (Fe)	80	D	S	
BE	G	Baelen-Nereth	Sq(g)		D1	S	G
BE	DP-VI	Donk		3	D1	S	
BE	DP-VI	Donk		4	D1	S	
BE	DP-VI	Donk		5	D1	S	
BE	DP-VI	Donk		8	D1	S	
BE	DP-VI	Donk		9	D1	S	
BE	DP-VI	Donk		11	D1	S	
BE	DP-VI	Donk		19	D1	S	
BE	DP-VI	Donk		20	D1	S	
BE	DP-VI	Donk		23	D1	S	
BE	DP-VI	Liberchies		31	D1	S	
BE	DP-VI	Liberchies		32	D1	S	
BE	DP-VI	Liberchies		33	D1	S	
BE	DP-VI	Montaigle	AR 4339	198	D1	S	
BE	DP-VI	Montaigle	AR 4340	199	D1	S	
BE	DP-VI	Montaigle	AR 4341	200	D1	S	
BE	DP-VI	Montaigle	AR 4345	204	D1	S	
BE	DP-VI	Sint-Martens-Latem		36	D1	S	
BE	DP-VI	Virton		39	D1	S	
BE	DP-VI	Virton		40	D1	S	
DE	DP-VI	Hiddenhausen-Oetingausen	AR 4331	190	D1	S	
DE	DP-VI	Porta-Westfalica	AR 4324	183	D1	S	
DE	DP-VI	Rees-Bergswick	AR 3845	180	D1	S	
DE	DP-VI	Soest-Ardey	AR 4328	187	D1	S	
NL	DP-VI	Bennekom		43	D1	S	
NL	DP-VI	Bennekom		44	D1	S	

NL	DP-VI	Bennekom		45	D1	S
NL	DP-VI	Bennekom		50	D1	S
NL	DP-VI	Colmschate		56	D1	S
NL	DP-VI	Colmschate		57	D1	S
NL	DP-VI	Dalfsen		82	D1	S
NL	DP-VI	Dalfsen		83	D1	S
NL	DP-VI	Dalfsen		84	D1	S
NL	DP-VI	Dalfsen		85	D1	S
NL	DP-VI	Dalfsen		86	D1	S
NL	DP-VI	Dalfsen		89	D1	S
NL	DP-VI	Ede-Veldhuizen		65	D1	S
NL	DP-VI	Ede-Veldhuizen		66	D1	S
NL	DP-VI	Ede-Veldhuizen		67	D1	S
NL	DP-VI	Ede-Veldhuizen		70	D1	S
NL	DP-VI	Ede-Veldhuizen		71	D1	S
NL	DP-VI	Ede-Veldhuizen		72	D1	S
NL	DP-VI	Ede-Veldhuizen		74	D1	S
NL	DP-VI	Oud-Leusden		77	D1	S
NL	DP-VI	Oud-Leusden		79	D1	S
NL	DP-VI	Oud-Leusden		80	D1	S
NL	DP-VI	Oud-Leusden		81	D1	S
BE	D-O	Erps-Kwerps	EKL 205.8	LO09	D1/2	S
BE	D-O	Erps-Kwerps	EKL 205.28	LO11	D1/2	S
BE	D-O	Erps-Kwerps	EKL 182.2	LO12	D1/2	S
BE	D-O	Erps-Kwerps	EKL 205.38	LO19	D1/2	S
NL	D-O	Breda		LO33	D1/2	S
NL	D-O	Gennep	2504/2	LO15	D1/2	S
NL	D-O	Voerendaal	107/3/55	LO16	D1/2	S
BE	DP-VI	Asper		2	D2	S
BE	DP-VI	Donk		7	D2	S
BE	DP-VI	Donk		14	D2	S
BE	DP-VI	Donk		16	D2	S
BE	DP-VI	Liberchies		30	D2	S
BE	DP-VI	Sint-Martens-Latem		38	D2	S
DE	DP-VI	Hiddenhausen-Oetingausen	AR 4329	188	D2	S
DE	DP-VI	Rees-Bergswick	AR 3846	181	D2	S
BE	D-O	Erps-Kwerps	EKL 205.15	LO05	D3	S
BE	DP-VI	Liberchies		27	D3	S
BE	DP-VI	Liberchies		28	D3	S
BE	DP-VI	Liberchies		29	D3	S
BE	D-O	Maaseik-Aldeneik	706/51.9	LO02	D3	S
FR	B-TL-L	Arras	Prélecture		D3	S
FR	B-TL-L	Arras	Prélecture		D3	S
FR	B-TL-L	Boulogne	BP 69		D3	S
FR	B-TL-L	Boulogne	Be 76		D3	S
FR	B-TL-L	Boulogne	B1		D3	S

FR	B-TL-L	Vron	216A		D3	S	
BE	DP-VI	Elewijt	AR 4369	208	D4	S	
BE	DP-VI	Kontich	AR 4350	209	D4	S	
DE	DP-VI	Emmerich-Praest	AR 3838	173	D4	S	
DE	DP-VI	Rees-Bergswick	AR 3843	178	D4	S	
DE	DP-VI	Rees-Bergswick	AR 3847	182	D4	S	
NL	DP-VI	Colmschate		53	D4	S	
NL	DP-VI	Colmschate		54	D4	S	
NL	DP-VI	Colmschate		55	D4	S	
NL	DP-VI	Colmschate		58	D4	S	
NL	DP-VI	Colmschate		59	D4	S	
NL	DP-VI	Colmschate		60	D4	S	
NL	DP-VI	Colmschate		61	D4	S	
NL	DP-VI	Colmschate		62	D4	S	
NL	DP-VI	Colmschate		63	D4	S	
NL	DP-VI	Colmschate		64	D4	S	
NL	DP-VI	Oud-Leusden		75	D4	S	
BE	D-O	Kerkhove	KER78/15bis/k3.9	LO08	D4/5	S	
BE	DP-VI	Sint-Martens-Latem		37	D4/5	S	
NL	D-O	Breda		LO32	D4/5	S	
NL	D-O	Ede-Veldhuizen	EV 71 622	LO14	D4/5	S	
BE	DP-VI	Donk		10	D5	S	
BE	DP-VI	Donk		17	D5	S	
BE	DP-VI	Donk		21	E	S	G
BE	G-VT	Hasselt - Kuringen - Rode Rokstraat	Sqg	22	E	S	G
BE	G-VT	Knesselare - Kouter	Gq	28	E	S	G
BE	G-VT	Knesselare - Kouter	Gq	29	E	S	G
BE	G-VT	Lummen - Meldert - Zelemsebaan	Sqg	3	E	S	G
BE	G-VT	Lummen - Meldert - Zelemsebaan	Sqg (Fe)	8	E	S	G
BE	DP-VI	Montaigle	AR 4343	202	E	S	G
BE	DP-VI	Montaigle	AR 4347	206	E	S	G
BE	DP-VI	Montaigle	AR 4348	207	E	S	G
BE	G-VT	Mortsel - Steenakker	Sqg	62	E	S	G
BE	G-VT	Nazareth - Eke - ‘s Gravendreef	Gq	69	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Gq (re)	33	E	S	G
BE	G-VT	Oudenburg - Spegelaere	G (cp/re)	34	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sgre	37	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqcag	38	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	42	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	43	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	45	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	47	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	48	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	49	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	51	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg	54	E	S	G

BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	55	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	56	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	57	E	S	G
BE	G-VT	Oudenburg - Spegelaere	Sqg (re)	58	E	S	G
BE	G-VT	Sint-Martens-Latem - Brakel - Torenhuis	Sqg	19	E	S	G
BE	G-VT	Turnhout - Tijl-en-Nelestraat	Sqg	63	E	S	G
BE	G-VT	Turnhout - Tijl-en-Nelestraat	Gq	64	E	S	G
BE	G-VT	Turnhout - Tijl-en-Nelestraat	Sqg	66	E	S	G
FR	B-TL-L	Arras	A IV (2)		E	G	G
FR	B-TL-L	Arras	A IV (4)		E	G	G
FR	B-TL-L	Arras	A IV (7)		E	G	G
FR	B-TL-L	Seclin	SF5(1A)		E	G	G
NL	DP-VI	Bennekom		46	E	S	G
NL	DP-VI	Bennekom		47	E	S	G
NL	DP-VI	Bennekom		48	E	S	G
NL	DP-VI	Bennekom		49	E	S	G
NL	DP-VI	Bennekom		51	E	S	G
NL	DP-VI	Bennekom		52	E	S	G
NL	G-VT	Breda - Steenakker	Gqb	91	E	S	GB
NL	DP-VI	Ede-Veldhuizen		68	E	S	G
NL	DP-VI	Ede-Veldhuizen		69	E	S	G

Appendix 3:
On Late Roman terra nigra foot-vessels

This appendix provides additional information on the Late Roman terra nigra foot-vessels discussed in Chapter 7. First a simplified petrographic classification table on the sampled Late Roman terra nigra pottery from the Low Countries is given. This petrographic classification has been made in collaboration with O. Stilborg in order to facilitate the comparison with the German research by C. Agricola. Second the list containing the interregional inventory on Late Roman foot-vessels from Belgium, the Netherlands, Germany and France is presented. This data has been compiled by C. Agricola, S. Heeren and V. Van Thienen.

Petrographic classification

This table provides schematic descriptions of each thin section of the Late Roman terra nigra foot-vessels.

Legend:

F = fine, M = medium coarse, C = coarse

S = sorted, U = unsorted

-- = very few, - = sparse, * = common, + = rich, ++ = abundant

O = ore, A/P = amphiboles/pyroxenes (dark minerals), Z = zircon, Mu = muscovite, Bi = biotite, Iso = isotropic material, cp = clay pellets, Fs = feldspars, Fe = iron

Nat = natural, hom = homogeneous, het = heterogeneous

ID	SITE	PG	PSG	COARSENESS	SORTING	SILT	FINE SAND	SAND	MICA	IRON OXIDE	CP	MINERALS	CHERT	R/PCQ	PLANT	FOSSIL	LITHIC	GROG	TEMPER	MAX GRAIN	WARE STRUCTURE	EXTRA FEATURES
01	LAN	4	A	M	S	+	*		*	-		O	+		--				nat	0,5	well hom	
02	LAN	1	A	F	S	+	-		*	*		A/P, Mu							nat	0,6	well hom	levigated?
03	LAN	U		M	S	*	+		-	*		O							nat	0,5	well hom	small ferrihydrite ++
04	OUD	4	B	M	S	+	+		*	*		O, Mu		*	--		?	+	grog	2,5	well hom	*lithic incl*
05	OUD	4	A	M	S	+	+		*	*		O, Mu, Bi	*						nat	0,5	hom	
06	OUD	1	C	F	S	*	*		*	*		O, A/P, Mu, Z							nat	0,7	well hom	short firing time
07	OUD	2		F	S	+	+		--	-				*	-				nat	0,35	well hom	
08	OUD	U		M	U	+	*	-	+	*		O, Mu, *Fs*	*				*		nat	1,2	well hom	*plagioclase, lithic incl*

09	OUD	3		M	S	+	+		*	*	*	O, A/P, Mu, Bi, iso						nat	0,4	well hom	slip?
10	OUD	1	A1	F	S	++	--		*	*	*	O, A/P, Mu+, Z						nat	0,4	well hom	*slip*
11	LUM	1	A1	F	S	++	--		++	*		Mu			-		?	nat (g?)	0,4	well hom	
12	LUM	4	A	M	S	+	+		--	*			+	*	--			nat	0,3	well hom	
13	LUM	1	A1	F	S	+	--		*	*		O, A/P, Mu, Z, iso						nat	0,6	well hom	
14	LUM	1	A1	F	S	++	--		+	*		Mu		*			?	nat	0,2	well hom	grog-cp?
15	TEM	1	A	F	S	++	-		*	*		O, A/P, Mu						nat	0,3	well hom	
16	GAV	1	D	F	S	+	-		*	*		O, A/P, Mu, Z	+	*				nat	0,45	well hom	
17	KRU	1	A1	F	S	+	--		*	*		O, A/P, Mu+, Z			-			nat	0,9	well hom	complex zoning/firing
18	TON	1	A1	F	S	++	--		+	*		Mu			-			nat	0,25	well hom	brown grains? ~3
19	TON	U		F/M	S	*	+		-	-		O, A/P, Mu, Z, iso			--			nat	0,25	well hom	angular silt and fine sand grains
20	TON	1	C	F	S	+	++		*	*	+	Mu, Bi	-					nat	0,25	well hom	mica rich slip or secondary process?
21	OUD	4	B	F	S	+	++		--	-		Mu, iso	+	*			+	grog	0,3	well hom	
22	OUD	1	D	M	S	-	+	+	*	+		Mu, iso, Fs	++	*				nat	0,45	hom	
23	OUD	4	A	M	S	*	+		*	*		O, iso	+					nat	0,5	well hom	
24	OUD	1	D	M	S	+	*		-	*		O, A/P, Mu, Z, iso	+	*				nat	0,5	well hom	
25	OUD	1	D	F/M	S	+	+		-	+	-	Mu, iso	++					nat	0,12	well hom	
26	OUD	1	D	M	S	+	+		+	*		Mu, iso	+	*				nat	0,45	well hom	
27	OUD	2		M	S	-	++		*	*	*	Fs, iso		*				nat	0,3	well hom	
28	OUD	4	A	M	S	+	-		*	*		Mu, Fs	+	*				nat	0,4	hom	different Core-Edge
29	OUD	4	A	M	S	+	+		*	*	*	Mu, iso, Fs	*	*				nat	0,3	hom	
30	OUD	2		M	S	*	+		?	?		O, A/P, Mu						nat	0,5	well hom	
31	OUD	2		M	S	+	+		*	*		O, A/P, Mu, Z						nat	0,35	well hom	

32	OUD	2		M	S	-	++		*	+	*	Mu, iso		*			?	nat (g?)	0,35	hom	1 grog grain?
33	OUD	4	B	M	S	+	+		-	*	*	iso		*			*	nat	0,4	well hom	vitrified grog grain
34	OUD	2		M	S	*	+		*	*		O, Mu						nat	0,4	well hom	
35	OUD	2		M	S	-	+		-	*		Fs, iso	*	*				nat	0,4	well hom	
36	OUD	2		F/M	S	+	-		*	*	*	Mu, iso	*	*				nat	0,2	well hom	
37	OUD	4	A	F/M	S	+	-		+	+		Mu, iso	*					nat	0,45	well hom	
38	WbD	1	D	F	S	+	+		*	*		Mu, Fs	*	*	-			nat	0,4	well hom	
39	WbD	1	D	F	S	+	-		*	+	*	Mu, iso, Fs	*	*				nat	0,45	well hom	unque inclusion?
40	WbD	U		M	S	*	+	--	+	+		O, A/P, Mu, iso						nat	1,3	well hom	hornblende as dark mineral
41	WbD	1	A	F	S	++	--		+	*	*	O, A/P, Mu, Z, iso						nat	0,4	well hom	levigated?
42	WbD	3		F/M	S	+	-		*	*	?	Mu						nat	0,4	hom	
43	WbD	1	A	F	S	++	--		+	*		Mu						nat	0,2	well hom	
44	WbD	1	A1	F	S	++	--		++	*		Mu						nat	0,15	well hom	
45	WIJ	1	A	F/M	S	++	+	*	+	*		Mu		*				nat	0,6	hom	levigated?
46	WbD	1	D	F/M	S	++	+	*	*	*	*	Mu, Bi?, Fs	*	*				nat	0,6	well hom	
47	TiP	1	A1	F	S	++	--	--	*	*	*	Mu			-			nat	0,6	well hom	
48	TiP	4	A	M	S	+	+		*	-	*	Mu, Fs	*	*				nat	0,6	well hom	
49	CUI	1	A	F	S	++	--		+	*	*	Mu						nat	0,25	well hom	
50	BeL	1	A	F	S	++	-		+	*		Mu, iso						nat	0,4	well hom	
51	WEH	1	A	F	S	+	--		+	*		Mu, iso						nat	0,7	well hom	levigated?
52	WEH	1	D	F	S	+	*		+	*		Mu, iso	*	*		?		nat	0,6	well hom	hornblende
54	TiP	U		M	S	+	+	--	+	*		O, A/P, Mu, iso			--			nat	1,2	hom	vomplex firing/clay mixture; small cp?
55	WbD	1	A1	F	S	++	-		++	*		Mu						nat	0,25	hom	clay mixing remnants?
56	WbD	1	A	F	S	++		-	*	*		Mu		*	?	?		nat	0,5	well hom	lithic?, diff firing zones, bimodal?

57	TiP	U		F	S	+	+		*	+	*	Mu, Bi?, Fs, iso	*	*	-	*			grog	0,2	hom	
58	TiP	1	A1	F	S	+	-	--	*	*	*	Mu, iso		*					nat	0,5	well hom	
59	TiP	1	A	F	S	++		*	+	+	*	Mu, Fs		*	-				nat	0,75	well hom	
60	BEU	1	D	F/M	S	++		--	*	*		Mu							nat	0,4	well hom	
61	BEU	1	A	F	S	++	--		*	*		Mu							nat	0,2	well hom	
62	RES	1	A	F	S	++			+	*		Mu		*				?	nat	0,45	well hom	1 grog/cp
63	RES	1	A1	F	S	++			+	+		Mu							nat	0,55	well hom	
64	RES	1	A	F	S	++			*	+		Mu							nat	0,3	well hom	
65	RIJ	1	D	F/M	S	+	+		*	*		Mu, iso	*	*					nat	0,5	well hom	
66	RIJ	1	A1	F	S	++			+	+		Mu, iso							nat	0,3	well hom	
67	RIJ	1	A	F	S	+	+		-	+		Mu, iso							nat	0,6	well hom	
68	RIJ	1	D	F/M	S	+	+		+	*	*	Mu, Fs, iso		*					nat	0,3	well hom	secondary calcite?
69	RIJ	1	A1	F	S	++			*	*		Mu, iso							nat	0,3	well hom	
70	RIJ	3		F/M	S	++	*		*	*	*	Mu	-				?		nat	0,3	well hom	lithic inclusion from sedimentary class?
71	RIJ	3		F/M	S	+	+		+	*		Mu, Bi, Fs, iso		*					nat	0,3	well hom	secondary calcite?
72	RIJ	3		F/M	S	+	+		+	*		Mu, Bi, Fs, iso		*			?		nat	0,35	well hom	hornblende, lithic fragm?, secondary calcite?
73	RIJ	1	A	F/M	S	++			*	*		Mu, Bi		*					nat	0,5	well hom	
74	RIJ	1	A	F/M	S	++	+		+	*	*	Mu, Bi, Fs, A/P		*					nat	0,4	well hom	
75	GEL	1	D	F	S	++	+		+	+	*	Mu	*	*					nat	0,2	well hom	
76	BRE	1	A	F	S	++	-		+	*		Mu							nat	0,15	well hom	
77	BRE	1	A	F	S	++		-	+	*	*	Mu, iso		*					nat	1	hom	yellow grains (=?)
78	BRE	4	A	M	S	+	+	-	+	+		Mu, iso, Bi?	*	*					nat	0,5	well hom	rounded chert
79	BRE	1	B	M	S	++	*		*	*		O, A/P, Mu, Fs, Bi?							nat	0,55	well hom	

80	BRE	1	B	M		S	++	*		+	*		Mu, Bi	*	*		nat	0,5	hom
81	BRE	1	B	M		S	+	+		+	+	*	Mu, A/P, iso	*	*		nat	0,55	hom
82	BRE	3		M		S	+	+		*	*		O, A/P, Z, Mu, Bi, iso	*			nat	0,4	well hom
83	BRE	1	B	M		S	+	*	-	+	-	+	Mu, Bi, iso		*		nat	0,5	well hom

Foot-vessels from Northern Gaul

C	M1	M2	#	Type	Context
BE	Andenne	Samson	1		burial
BE	Arlon	Fouches	1	Chenet 342	burial
BE	Baelen	Nereth	4	Gellep 273	"germanic" settlement
BE	Bilzen	Bilzen	1	Chenet 342	burial
BE	Chiney	Izel	1	Chenet 342	settlement
BE	Dinant	Furfooz	2	Chenet 342	burial
BE	Gavere	Asper	2	Chenet 342	settlement
BE	Herk-de-Stad	Donk	1	Chenet 342	settlement
BE	Herstal	Herstal	1		
BE	Kinrooi	Kinrooi	1	Chenet 342	
BE	Kortrijk	Kortrijk	2	Chenet 342	settlement
BE	Kruishoutem	Kapellekouter	2	Chenet 342	settlement
BE	Lanaken	Neerharen-Rekem	14	Vanvinckenroye 24a, Chenet 342, Pirling 131a-b	burial/fort?settlement?
BE	Leuze-en-Hainaut	Blicquy	1	?	burial
BE	Lixhe	Loen	1	Chenet 342	settlement; villa rustica
BE	Lummen	Meldert	4		settlement
BE	Lüttich	Herstal	1		burial
BE	Luttre-Liberchies	Brunehaut	1	Chenet 342	fort
BE	Mons	Ciply	1		
BE	Mortsel	Mortsel	2		settlement
BE	Oudenburg	Oudenburg	3		fort
BE	Philippeville	Jamiolle	1	Chenet 342	burial
BE	Temse	Temse	1	Chenet 342	settlement
BE	Tongeren	Piringen	1		Chenet 342
BE	Tongeren	Tongeren	8	Chenet 342	burial
BE	Tournai	Tournai	1	Gellep 252	burial
DE	Altrip	Altrip	3	Form 4 (nach Bernhard 1985, 90)	fortification (burgus)
DE	Asperden	Asperden	1		
DE	Augustdorf	Grastrup-Hölsen	10		settlement

DE	Bad Urach	Runder Berg bei Urach	1		settlement
DE	Bergisch-Gladbach	Mutzerfeld	1	Gellep 273	burial
DE	Bielefeld	Sieker	1		?
DE	Bielefeld	Stieghorst	1		burial
DE	Bochum	Harpen	18	Gellep 273	settlement
DE	Bochum	Langendreer	1		settlement
DE	Bochum	Werne	3		settlement
DE	Bonn	Bad Godesberg	1	Chenet 342b	burial
DE	Bonn	Schwarzrheindorf	1	Gellep 131	burial
DE	Borken	Borken-West	3	Gellep 273	settlement
DE	Borken	Borken-West	45	Sonderform	settlement
DE	Bremen	Bremen-Mahndorf	1		burial
DE	Bremen	Bremen-Wartum, Am Seefelde	2		settlement
DE	Butjadingen	Langwarden	1		stray find
DE	Castrop-Rauxel	Habinghorst	1		
DE	Castrop-Rauxel	Ickern	51	Gellep 273+274	settlement
DE	Castrop-Rauxel	Zeche Erin	43	Gellep 273+274	trade centre
DE	Dorsten	Holsterhausen	4	Gellep 273	settlement
DE	Dortmund	Asseln	27	Gellep 273	burial
DE	Dortmund	Oespel	17	Gellep 273	settlement
DE	Duisburg	Alter Markt	1		settlement
DE	Duisburg	Beekstraße	2		settlement
DE	Echzell	"Heinrichswiese"	1	Zuordnung fraglich?	settlement
DE	Edenkoben	Gommersheim	1	Chenet 342	
DE	Elsfleth	Huntebruck-Wührden	1		settlement
DE	Emmerich	Praest	1		Hermsen 2007, afb. 97
DE	Eschweiler	Lohn	1	Gellep 252 (bzw. 273-274/Chenet 342)	kiln
DE	Essen-Hinsel	Überruhr; Flur "Sonderfeld"	83	Gellep 273	settlement
DE	Flögeln	Flögeln-Eekhöltjen	1		settlement
DE	Fritzlar	Geismar	15	Gellep 273	settlement
DE	Geismar	"Am Kalten Born"	1	Gellep 273	settlement

DE	Göttingen	Gleichen	1		Hermsen 2007, afb. 97
DE	Gudensberg	Gleichen "Rosenfeld"	9		settlement
DE	Gudensberg	Obervorschütz "Hofestadt"	42		settlement
DE	Hamm	Westhafen, Herringen	5	Gellep 273	settlement
DE	Heek	Wichum	21	Sonderform	settlement
DE	Heek	Wichum	4	Gellep 273	
DE	Herzebrock	Clarholz	1		settlement
DE	Hiddenhausen	Oetinghausen	40		settlement
DE	Hürth	Hermülheim	3	Gellep 274	burial
DE	Hürth	Hermülheim	1	Chenet 342c/Gellep 274	
DE	Jüchen	Jüchen	2	Gellep 273	
DE	Jülich	Starenweg, Bereich B	1	Chenet 342	burial
DE	Kamen	Westick	93	Gellep 273+274	settlement
DE	Kirchlengern	Kirchlengern	1		settlement
DE	Köln	Deutz-Divitia	24	Gellep 273	fort/settlement
DE	Köln	Köln-Jägerstraße	1		burial
DE	Köln	Köln-Luxemburgerstraße	1		burial
DE	Köln	Köln-Müngersdorf	1	Gellep 131?	burial
DE	Köln	Köln-Quentelstraße	1	Gellep 273	burial?
DE	Köln	Köln-St. Severin	1	Gellep 131b	burial
DE	Köln	Merheim	9	Gellep 273	settlement
DE	Köln	Porz	1	Gellep 131	settlement
DE	Köln	Widdersdorf "Im Buschfeld"	1	Gellep 273	villa rustica/fortification (burgus)
DE	Köln-Deutz	Urbanstraße	1		
DE	Krefeld	Krefeld-Gellep	1	Gellep 131	burial
DE	Krefeld	Krefeld-Gellep	7	Gellep 252	
DE	Krefeld	Krefeld-Gellep	5	Gellep 273	
DE	Krefeld	Krefeld-Gellep	6	Gellep 274	
DE	Ladenburg	Wüstung Botzheim	1	Chenet 342	settlement
DE	Leer	Leer	1		
DE	Leverkusen	Rheindorf	11	Gellep 273	burial

DE	Lich	Dorfwüstung "Arnsburg"; Gemarkung Muschenheim	1		settlement?
DE	Lohne	Lohne	1		settlement
DE	Meerdorf	Meerdorf	1		
DE	Melle	Oldendorf	2	Gellep 273	settlement
DE	Moers-Asberg	Burgfeld	1		fortification (burgus)
DE	Monheim-Baumberg	"Haus Bürgel"	5	Chenet 342	fort
DE	Niedenstein	Kirchberg "Auf dem Kirchberg"	6		settlement
DE	Niederzier, Elsdorf	Villa Hambach 132	1	Chenet 342	villa rustica
DE	Osnabrück	Atter	2	Gellep 273	burial
DE	Paderborn	Paderborn	1		settlement
DE	Recklinghausen	Suderwich	1		settlement?
DE	Rees	Haffen	24		settlement
DE	Remagen	Remagen	1	Chenet 342	fort
DE	Rösrath	Hasbach	1		burial
DE	Sankt Augustin	Hangelar	2	Gellep 273	settlement
DE	Soest	Soest-Ardey	14	Gellep 273	settlement
DE	Soest	Soest-Ardey	2	Gellep 274	settlement
DE	Soest	Soest-Ardey	9		settlement
DE	Speyer	Speyer; Domhügel	2	Chenet 342	settlement
DE	Troisdorf	Fliegenberg	1		burial
DE	Unterlübbe	Hille	2		sanctuary
DE	Varel	Bramloge	1		burial
DE	Wardenburg	Oberlethe	1		settlement; stray find
DE	Wiefelstede	Gristede	1		settlement
DE	Winkelsett	Mahlstedt	31		settlement
DE	Zweibrücken	Niederauerbach	1	Chenet 342	burial
EN	Richborough	Richborough	1	Chenet 342	fort
FR	Arras	Arras	1	Chenet 342	
FR	Arras	Conseil Général du Pas-de-Calais, Rue de la Paix	1	Chenet 342	burial
FR	Attin	Les Trente	1	Chenet 342	settlement
FR	Bavay	Forum-Bavay	1	Chenet 342	settlement (forum)
FR	Boullay-Thierry	La Noé	2	Chenet 342	burial

FR	Boulogne-sur-Mer	Marquise/Rinxent	1	Chenet 342	burial
FR	Boulogne-sur-Mer	Vieil-Atre	1	Chenet 342	burial
FR	Brebières	Brebières	1	Chenet 342	settlement/villa rustica
FR	Breny	Breny	2	Chenet 342	burial
FR	Brumath-Stephansfeld	Brumath-Stephansfeld	1	?	burial
FR	Bulles	Saine-Fontaine	3	Chenet 342	burial
FR	Candor	Candor	1		
FR	Canehan	Bourg l'Abbé	1	Chenet 342	
FR	Chartres	Saint-Barthélémy	1	Chenet 342	burial
FR	Chouy	Chouy	1		
FR	Compiégne	Champlieu	1		
FR	Compiègne	Chevincourt	2	Chenet 342	burial
FR	Dourges	Dourges	1		settlement
FR	Dourges	Marais de Dourges	1	Chenet 342	burial
FR	Duisans	La Cité	1	Chenet 342	burial
FR	Fauillet	Fauillet	1	Chenet 342	burial
FR	Fel	Fel	1		burial
FR	Graincourt-lès-Havrincourt	L'arbre-chaud	1	Chenet 342	
FR	Harnes	Harnes	1	Chenet 342	burial
FR	Hombliéres	Abbeville	1	Chenet 342	burial
FR	Lavoye	Haus der Hypokausten	1	Chenet 342h	settlement/ burial
FR	Lavoye	Ofen E	1	Chenet 342i	settlement/burial
FR	Lavoye	Sépulture A	15	Chenet 342	settlement/burial
FR	Lewarde	Terres Noire	1		settlement
FR	Marenla	Le But de Marles	1	Chenet 342	burial
FR	Maule	Pousse Motte	1	Chenet 342	burial
FR	Merteville	Merteville	1	Chenet 342	burial
FR	Mittelbronn	Mittelbronn	2		settlement
FR	Montigny	Montigny	1		
FR	Nouvion-en-Ponthieu	Nouvion-en-Ponthieu	2	Chenet 342	burial
FR	Noyelles-sur-Mer	Noyelles-sur-Mer	1	Chenet 342	burial
FR	Oisy-le-Verger	Bois du Quesnoy	1	Chenet 342	burial
FR	Pîtres	Pîtres	3	Chenet 342	settlement

FR	Port	Port-le-Grand	2	Chenet 342	burial
FR	Rouen	La cathédrale	1	Chenet 342	settlement
FR	Rouen	Rouen	1		
FR	Rouen	Saint-Ouen-du-Breuil	29	Chenet 342	settlement
FR	Saint-Sauveur	Saint-Sauveur	1	Chenet 342; Chenet 342b	burial
FR	Sallaumines	Sallaumines	1		
FR	Sées	Grand-Herbage	1	Chenet 342	settlement
FR	Septeuil	Septeuil	15	Chenet 342	Mithras temple
FR	Thérouanne	Le bois Robichet	1		
FR	Thérouanne	Thérouanne	1	Chenet 342	settlement
FR	Thérouanne/Vallée de l'Aa	Thérouanne/Vallée de l'Aa	1	Chenet 342	
FR	Tourdan	Tourdan	2		settlement
FR	Troyes	Troyes	1		
FR	Vermand	Vermand	1		burial
FR	Vert-la-Gravelle	Mont Augé	1	Chenet 342	burial
FR	Vireux-Molhain	Vireux-Molhain	1	Chenet 342 (b?)	burial
FR	Vron	Vron	10	Chenet 342	burial
FR	Zouafques	Wolphus	2	Chenet 342	settlement
NL	Arum	Arum	1		
NL	Beneden Leeuwen	De Ret	1	Chenet 342	settlement
NL	Beuningen	Ewijk	1	Gellep 273	settlement
NL	Born Holtum	Born Holtum-Noord	1		
NL	Breda-West	Steenakker	1	Chenet 342	settlement
NL	Bunnik	Odijk, Singel-West/Schoudermantel	1	Chenet 342	settlement
NL	Castricum	Osterbuurt	1	Chenet 342	settlement
NL	Coevorden	Aalden	1	Chenet 342	burial
NL	Colmschate	Skibaan	41	Chenet 342	settlement
NL	Cothen	De Zemelen	1	Chenet 342	settlement
NL	Cuijk	De Nielt	1	Chenet 342	
NL	Cuijk	De Nielt	1	Gellep 273	
NL	Cuijk	Martinuskerk	1	Chenet 342	
NL	Cuijk	terrein 6000	1	Gellep 273	fort/settlement
NL	Cuijk	terrein 6000	1	Chenet 342	
NL	Dalfsen	Dalfsen	2	Chenet 342	settlement
NL	Dalfsen	Emmen	3		settlement
NL	Dalfsen	Hessum	1		settlement

NL	Dalfsen	Lenthe	3	Chenet 342	settlement
NL	Dalfsen	Oosterdalfsen	1		settlement
NL	Dalfsen	Welsum	1	Chenet 342	settlement
NL	Deventer	Bathmen-Bergakker	1	Chenet 342	settlement
NL	Deventer	Deventer-Colmschate, De Scheg	1		
NL	Deventer	Deventer-Colmschate, Dortmundstraat	1		
NL	Deventer	Deventer-Colmschate, Grote Ratelaar	1		
NL	Didam	Didam-Aalsbergen	9		
NL	Driel	Oldenhof	1	Alzey 25	
NL	Driel	Oldenhof	1	Chenet 342	
NL	Dronrijp	Hatsum	1		
NL	Dronrijp	Fûgellan	1	Chenet 342	
NL	Ede	Bennekom	20	Chenet 342	settlement
NL	Ede	Maanen	1	Chenet 342	settlement
NL	Ede	Maanen	1	Gellep 273	settlement
NL	Ede	Op den Berg	1	Chenet 342	settlement
NL	Ede	Op den Berg	1	Gellep 273	settlement
NL	Ede	Veldhuizen	1	Chenet 342	settlement
NL	Ede	Veldhuizen	1	Gellep 273	settlement
NL	Garderen	Garderen-Beumelerberg	1		
NL	Geldrop-Mierlo	Geldrop-'t Zand, Genoenhuis	1		settlement
NL	Gennep	Maaskemp West	45	Chenet 342	settlement/burial
NL	Gennep	Maaskemp West	2	Gellep 273	
NL	Goirle	Huzarenweide	1	Chenet 342	settlement
NL	Helden	Schrames	1	Chenet 342	
NL	Hellendoorn	Nijverdal	1		
NL	Hof van Twente	Markelo-Elsen	1	Chenet 342	settlement
NL	Hof van Twente	Markelo-Elsen	1	Gellep 273	settlement
NL	Hooghalen	Hooghalen	1		
NL	Hunsel	Hunsel	1	Chenet 342	
NL	Leeuwarden	Goutum-Wirdum	1	Chenet 342	
NL	Leur	Leur-De Galgenberg	1	Chenet 342	burial

NL	Lingewaard	Gendt	1		
NL	Lingewaard	Ressen	1	Chenet 342	settlement
NL	Lingewaard	Ressen	1	Gellep 273	settlement
NL	Lutjelollum	Lutjelollum	1	Chenet 342	
NL	Maasbracht	Linne	1	Gellep 273	burial
NL	Midden-Drenthe	Beilen		Chenet 342; Gellep 273	burial
NL	Midden-Drenthe	Wijster	1	Chenet 342	settlement
NL	Midden-Drenthe	Wijster	1	Gellep 273	settlement
NL	Nijmegen	cemetery B	1	Chenet 342	burial
NL	Nijmegen	cemetery B	1	Gellep 273	burial
NL	Nijmegen	cemetery OO	1	Chenet 342	burial
NL	Nijmegen	cemetery OO	1	Gellep 273	burial
NL	Nijmegen	Hugo de Grootstraat-grafveld OO	1	Gellep 274	
NL	Nijmegen	Marienburg	1	Gellep 274	settlement
NL	Nijmegen	Nieuwstraat	1		burial
NL	Nijmegen	Valkhof (I)	1		
NL	Nijmegen	Lent	4	Chenet 342	
NL	Ommen	Varsen	3		settlement
NL	Ommen	Zeesse	1	?	burial/settlement
NL	Peelo	Peelo	1		
NL	Raalte	Heeten	5	Chenet 342+Priling 273 ähnl.	settlement
NL	Rhee	Rhee	1		
NL	Rhenen	Donderberg	1		burial
NL	Rhenen	Elst, Steenoven	1	Chenet 342	
NL	Rhenen	Elst, 't Woud	1	Chenet 342	burial
NL	Rhenen	Rhenen	9		burial
NL	Rhenen	Utrechtsestraatweg (II)	1		settlement
NL	Rijswijk	De Bult	1	Chenet 342	settlement
NL	Schagen	Muggenberg	1		
NL	Sittard-Geelen	Geleenderveld	1	Chenet 342	villa rustica
NL	Sittard-Geelen	Sittard-Geelen	1		villa rustica
NL	Someren	Waterdael	1	Chenet 342	burial
NL	Stein	Stein	1		settlement
NL	Swalmen	Swalmen	1	Chenet 342	
NL	Texel	Den Burg	1		
NL	Tiel	Passewaaijse Hogeweg, nederzetting	1	Chenet 342	settlement

NL	Twenterand		Den Ham	1		settlement?
NL	Twenterand		Hoge Hexel	1		settlement?
NL	Tynaarlo		Midlaren	1	Chenet 342	settlement
NL	Tzum		De Botertobbe	1		
NL	Tzum		De Parel	1		
NL	Wageningen		Diedenweg-Wageningen	10	Chenet 342	burial/settlement
NL	Wehl		Hessenveld	1	Chenet 342	settlement
NL	Wehl		Hessenveld	43	Gellep 273	
NL	Wehl		Nieuw Wehl	1		
NL	Wierden		Hooge Hexel	1		
NL	Wijchen		centrum	1	Chenet 342	burial cremation
NL	Wijchen		Herenstraat	1	Chenet 342	
NL	Wijchen		Leur, Galgenberg	1	Chenet 342	burial
NL	Wijchen		Meshallen	1	Chenet 342	
NL	Wijchen		Tienakker	1	Chenet 342	settlement
NL	Wijk bij Duurstede		De Geer	18	Chenet 342	settlement
NL	Wijk bij Duurstede		De Geer	4	Gellep 273	settlement
NL	Wimmer		Wimmer	1		
NL	Winsum		Ezinge	1		settlement
NL	Zelhem		Rondweg	1		
NL	Zuidlaren		Midlaren	1	Chenet 342	
NL	Zutphen		Ooijerhoek	1		
NL	Zweelo		Zweelo	1		burial
NL	Zwolle		Bikkenrade	1		
NL	Zwolle		Wijthmen	1		

Appendix 4:
On Crossbow brooches

This appendix provides the supporting data for the Low Countries crossbow brooches discussed in Chapter 8. First the list with data (net peak areas per element) from the handheld XRF analyses are provided, followed by the measurements of the total and partial dimensions.

Handheld XRF dataset

Supplementary dataset of the hXRF data: provided are the remaining measurements of the 138 brooches without corrosion or contaminants. For every measurement are given: the Low Countries Crossbow Brooches ID, an existing or given collection ID, the type of crossbow brooch, the site and the elemental net peak areas per element present in the XRF spectrum.

ID	Coll. ID	Type	Site	Si	K	Ca	Ti	V	Cr	Mn	Fe	Ni	Cu	Zn	As	Ag	Sn	Sb	Au	Hg	Pb
CB 001	Graf 01	3/4	Oudenburg	686	44270	1,31E+06	1733	2651	5	23527	91279	31654	1,59E+07	1,72E+06	0,001	8202	176895	1317	0,001	544	515209
CB 001	Graf 01	3/4	Oudenburg	3684	57758	553862	1487	0,001	11044	5674	143231	32650	1,61E+07	3,10E+06	0,001	9522	179744	1509	0,001	305	291609
CB 001	Graf 01	3/4	Oudenburg	1212	55466	1,14E+06	2202	1787	1210	24164	154875	34371	1,75E+07	925501	0,001	8584	196801	1221	0,001	687	301487
CB 002	Graf 02	3/4	Oudenburg	0,001	40972	1,19E+06	2043	0,001	6801	11810	196285	34147	1,72E+07	1,38E+06	11846	8699	175631	1612	0,001	680	329656
CB 002	Graf 02	3/4	Oudenburg	434	40916	481633	1368	0,001	11009	2765	270577	25137	1,77E+07	1,09E+06	31072	8733	165606	1462	0,001	376	323213
CB 002	Graf 02	3/4	Oudenburg	398	28569	309166	1987	0,001	8262	10754	183809	34163	1,90E+07	632051	5377	6754	30607	296	0,001	1261	52386
CB 003	Graf 14	2	Oudenburg	5252	59803	525275	3341	0,001	4770	3126	184823	28261	1,41E+07	1,51E+06	0,001	6406	218266	1431	0,001	2104	2,07E+06
CB 004	Graf 19	3/4	Oudenburg	1189	54056	339937	1477	16864	0,001	34251	86454	53361	1,78E+07	590434	0,001	10463	181834	803	0,001	323	462177
CB 004	Graf 19	3/4	Oudenburg	884	60560	292269	1002	0,001	19596	1983	132310	28143	1,89E+07	474124	0,001	11029	201073	1109	0,001	334	461921
CB 004	Graf 19	3/4	Oudenburg	0,001	54701	806970	3302	5244	4431	31420	94731	39328	1,83E+07	218087	245	7400	205059	123	0,001	100	138045
CB 005	Graf 20	3/4	Oudenburg	2193	76272	359822	4848	8616	3793	29970	199040	56989	1,60E+07	1,52E+06	4029	9928	216240	1583	0,001	404	526560
CB 005	Graf 20	3/4	Oudenburg	1596	53304	286107	2075	0,001	10225	9653	213157	31553	1,61E+07	1,89E+06	0,001	9109	207118	1730	0,001	644	981728
CB 005	Graf 20	3/4	Oudenburg	1847	49610	192818	2533	4236	5890	23846	257106	45033	1,61E+07	1,97E+06	0,001	11239	146553	1232	0,001	528	626612
CB 006	Graf 26	3/4	Oudenburg	0,001	13872	78689	0,001	0,001	19775	3723	178969	21911	1,89E+07	1,43E+06	4677	3908	25	162	0,001	1283	26336
CB 006	Graf 26	3/4	Oudenburg	0,001	4020	62476	0,001	10651	0,001	51655	139236	20841	1,81E+07	2,44E+06	8989	4365	279	219	0,001	1003	40055
CB 006	Graf 26	3/4	Oudenburg	0,001	9456	138720	1770	12587	5267	44224	130368	24852	1,91E+07	1,37E+06	9255	5584	596	276	0,001	949	52300
CB 006	Graf 26	3/4	Oudenburg	0,001	15641	89342	0,001	5315	5096	17656	185597	60516	1,96E+07	650636	7535	5622	17324	171	0,001	1348	27956
CB 007	Graf 27	3/4	Oudenburg	0,001	19246	238578	626	0,001	7186	6291	520955	26205	1,45E+07	3,39E+06	13934	2085	10581	142	0,001	324	398919
CB 007	Graf 27	3/4	Oudenburg	0,001	9913	257417	0,001	3296	1447	28185	516897	32656	1,59E+07	3,22E+06	7414	2404	9511	201	0,001	0,001	405111
CB 007	Graf 27	3/4	Oudenburg	766	15110	91196	4918	0,001	16492	5350	869589	24269	1,67E+07	2,24E+06	15266	2990	12913	236	0,001	1253	459899
CB 007	Graf 27	3/4	Oudenburg	1304	35509	286780	1489	0,001	10769	9754	160209	39982	1,75E+07	2,01E+06	9619	5538	36061	207	0,001	1006	55301

CB 008	Graf 34	3/4	Oudenburg	0,001	33411	527814	14443	0,001	5181	9128	227227	32030	1,58E+07	1,71E+06	49963	25798	85731	1531	0,001	1413	815010
CB 008	Graf 34	3/4	Oudenburg	3530	45846	572702	13807	0,001	9267	3551	243130	37259	1,48E+07	1,97E+06	9976	20489	129374	1201	0,001	1033	1,30E+06
CB 009	Graf 37	2	Oudenburg	0,001	36952	88461	7517	17979	6040	13267	157656	62179	2,01E+07	28943	15412	15169	58925	2364	7088	3370	17556
CB 009	Graf 37	2	Oudenburg	2340	68146	80383	16385	16462	5501	0,001	73101	34384	1,68E+07	19890	25115	11309	52522	3360	1,43E+06	167445	16982
CB 009	Graf 37	2	Oudenburg	460	59653	91136	11138	0,001	7180	449	123961	30988	2,04E+07	31648	15700	16893	85293	2742	34305	9180	21943
CB 010	Graf 41	2	Oudenburg	1167	60553	248881	3443	8213	2293	29190	77981	53720	1,59E+07	1,14E+06	0,001	7297	209857	2486	0,001	985	1,03E+06
CB 010	Graf 41	2	Oudenburg	4619	65136	338386	5614	0,001	9190	6305	93100	29969	1,50E+07	933163	0,001	8620	262136	2864	0,001	1584	1,81E+06
CB 010	Graf 41	2	Oudenburg	2670	77114	370150	2980	0,001	11517	3716	171263	33810	1,70E+07	1,31E+06	0,001	9408	261567	2665	0,001	353	729150
CB 011	Graf 42	3/4	Oudenburg	1175	52345	455468	2125	4956	1351	27795	61094	48949	1,54E+07	2,64E+06	0,001	10261	217634	365	0,001	119	627239
CB 011	Graf 42	3/4	Oudenburg	1771	56608	348608	2106	0,001	8487	4550	83012	41824	1,65E+07	2,24E+06	0,001	10641	223465	339	0,001	96	606533
CB 011	Graf 42	3/4	Oudenburg	0,001	35751	711136	5357	6545	7099	19231	229994	39561	1,67E+07	2,02E+06	4902	5144	49000	2294	0,001	591	160957
CB 012	Graf 49	6	Oudenburg	3915	49378	160062	129673	1685	3556	5080	79858	31064	1,45E+07	1,34E+06	39708	7528	132453	556	0,001	1258	2,01E+06
CB 012	Graf 49	6	Oudenburg	1717	38081	168442	1625	0,001	14376	455	99072	23246	1,70E+07	977756	18956	6795	116887	596	0,001	977	1,25E+06
CB 012	Graf 49	6	Oudenburg	988	30727	118275	3431	0,001	6099	12729	423735	39385	1,49E+07	372214	28172	8177	159808	786	0,001	1648	2,18E+06
CB 012	Graf 49	6	Oudenburg	598	25128	127358	793	2549	4230	19506	62165	39912	1,51E+07	1,30E+06	27777	7261	127400	698	0,001	1400	1,71E+06
CB 014	Graf 59	2	Oudenburg	429	51935	230774	3372	5821	2499	26904	419230	45145	1,60E+07	593747	0,001	27795	222196	1660	0,001	1051	1,32E+06
CB 014	Graf 59	2	Oudenburg	6539	59058	219466	4914	0,001	10550	1670	388031	28704	1,43E+07	476750	47822	21388	193993	1594	0,001	2232	2,25E+06
CB 014	Graf 59	2	Oudenburg	2844	88200	445305	4455	0,001	19327	2387	111712	31547	1,90E+07	602526	12082	7712	336772	1220	1379	1106	24746
CB 015	Graf 72	3/4	Oudenburg	268	26157	195002	0,001	7854	0,001	44682	234574	28567	1,82E+07	839143	0,001	7010	93924	1108	0,001	721	446056
CB 015	Graf 72	3/4	Oudenburg	727	38211	648191	0,001	0,001	14671	1800	346768	23059	1,84E+07	471686	0,001	9875	107846	971	0,001	177	536142
CB 015	Graf 72	3/4	Oudenburg	1051	33626	358808	1725	0,001	14475	2655	1,94E+06	26608	1,62E+07	977668	0,001	9577	145866	1257	0,001	48	602856
CB 016	Graf 83	3/4	Oudenburg	0,001	17155	54119	0,001	5794	1133	28797	320616	22491	1,79E+07	1,91E+06	18507	5197	22968	724	0,001	1116	241348
CB 016	Graf 83	3/4	Oudenburg	1233	26645	175765	0,001	0,001	10574	11384	442024	37568	1,73E+07	2,60E+06	14445	5868	21891	709	0,001	630	158132
CB 016	Graf 83	3/4	Oudenburg	0,001	28790	108291	939	1113	7107	11074	358255	33424	1,79E+07	1,62E+06	10104	3568	64219	1761	0,001	1673	93565
CB 016	Graf 83	3/4	Oudenburg	0,001	24749	82466	0,001	0,001	16913	1570	424823	14854	1,77E+07	1,69E+06	18437	5428	25262	710	0,001	612	181085
CB 017	Graf 103	3/4	Oudenburg	0,001	22237	115573	85	3190	3540	23259	126897	41552	1,56E+07	1,27E+06	28333	8904	80892	685	0,001	2489	1,62E+06
CB 017	Graf 103	3/4	Oudenburg	0,001	22923	139719	630	1220	5215	15138	153153	33855	1,65E+07	1,21E+06	35296	6314	75500	335	0,001	1187	1,13E+06
CB 017	Graf 103	3/4	Oudenburg	0,001	29132	139225	1604	3503	5655	23364	147878	43048	1,51E+07	1,71E+06	40569	7254	83747	638	0,001	1030	1,37E+06
CB 018	Graf 104	3/4	Oudenburg	1018	32742	259218	2578	2403	4904	20038	68301	48388	1,44E+07	536866	136475	6339	109715	2232	0,001	3538	2,33E+06
CB 018	Graf 104	3/4	Oudenburg	2941	30267	253459	4229	0,001	10361	2422	94687	47002	1,39E+07	1,29E+06	68883	6357	102520	2648	0,001	2141	2,17E+06

CB 019	Graf 111	6	Oudenburg	939	19394	79724	13340	0,001	28007	0,001	80342	37710	1,65E+07	201342	31010	12312	9022	4264	1,44E+06	113280	68284
CB 019	Graf 111	6	Oudenburg	0,001	8287	18229	109968	4802	7253	0,001	315488	24809	1,87E+07	305528	10817	8003	6310	746	615670	48607	23899
CB 020	Graf 114	3/4	Oudenburg	2075	46384	143032	5970	968	10666	9570	155978	65597	1,28E+07	893504	77918	3325	128343	128	0,001	3408	2,48E+06
CB 020	Graf 114	3/4	Oudenburg	3593	62049	238519	3526	0,001	9089	8417	539640	37260	1,65E+07	1,70E+06	27480	6428	113756	1515	0,001	854	386472
CB 021	Graf 115	3/4	Oudenburg	2250	29646	184066	0,001	0,001	13350	1337	230965	18544	1,90E+07	537666	0,001	4177	86779	131	0,001	1072	421823
CB 021	Graf 115	3/4	Oudenburg	1015	37073	242976	391	5246	5056	35226	182388	45080	1,67E+07	1,84E+06	0,001	2865	90476	0,001	0,001	690	535243
CB 021	Graf 115	3/4	Oudenburg	1378	37523	265531	382	0,001	13044	4636	190014	38399	1,73E+07	1,14E+06	0,001	3235	112450	0,001	0,001	306	732504
CB 022	Graf 124	6	Oudenburg	0,001	24048	43937	0,001	19424	0,001	15730	153159	67189	1,78E+07	941162	21260	4372	36886	216	126635	2496	137518
CB 022	Graf 124	6	Oudenburg	486	26221	93414	8237	0,001	10695	5434	189795	42349	2,00E+07	524287	17975	4495	49911	453	0,001	1177	134681
CB 022	Graf 124	6	Oudenburg	0,001	28351	133763	23175	0,001	14774	0,001	156129	35161	1,89E+07	976134	22646	6871	46334	333	0,001	947	108611
CB 022	Graf 124	6	Oudenburg	0,001	45809	121941	8220	22656	6689	12535	222569	65307	1,85E+07	195020	15246	30424	92219	468	0,001	1142	224991
CB 023	Graf 129	3/4	Oudenburg	1548	50554	256212	4073	4408	1986	28914	208421	39286	1,77E+07	768127	0,001	7521	152176	1204	0,001	849	664780
CB 023	Graf 129	3/4	Oudenburg	2580	68639	285597	1011	0,001	10926	2108	493460	24250	1,79E+07	857923	0,001	11041	222528	1649	0,001	254	563851
CB 023	Graf 129	3/4	Oudenburg	0,001	33172	303282	3576	0,001	11758	9102	243417	40818	1,83E+07	807060	4209	3829	29043	1186	0,001	1192	93578
CB 024	Graf 132	3/4	Oudenburg	0,001	26897	107713	1335	0,001	8908	13565	208175	31521	1,62E+07	2,46E+06	25626	3062	64226	1042	0,001	1293	306076
CB 026	Graf 152	5	Oudenburg	54	32180	139007	7720	0,001	3418	9993	416813	48604	1,57E+07	384081	11182	20628	361814	0,001	0,001	868	1,15E+06
CB 026	Graf 152	5	Oudenburg	0,001	8222	50992	6986	0,001	13182	3207	270589	30326	2,07E+07	43771	30530	2626	186	244	1010	1047	20673
CB 026	Graf 152	5	Oudenburg	1494	50910	65922	5935	4113	6669	7261	770711	68435	1,46E+07	113810	30740	18446	148402	77	16486	4520	689991
CB 027	Graf 165	2	Oudenburg	983	32280	173865	635	5617	3363	28575	246443	47152	1,65E+07	1,59E+06	22560	6314	89005	2316	0,001	761	682224
CB 027	Graf 165	2	Oudenburg	189	30173	243897	3515	0,001	15447	3760	430839	32385	1,66E+07	927642	9436	5813	87422	2477	0,001	773	970090
CB 027	Graf 165	2	Oudenburg	0,001	20827	533942	672	1436	4572	11887	220753	35553	1,77E+07	1,49E+06	18192	3118	32276	3766	0,001	755	177209
CB 028	Graf 169	3/4	Oudenburg	615	72196	64636	10115	14470	18548	11645	192471	64106	1,54E+07	61732	142439	11125	65896	968	722008	31053	20441
CB 028	Graf 169	3/4	Oudenburg	0,001	21757	93356	10645	0,001	24491	0,001	91388	23479	2,06E+07	179284	87929	2913	53887	552	0,001	745	29462
CB 029	Graf 172	3/4	Oudenburg	658	69658	836042	2961	5597	2193	26377	149114	47650	1,71E+07	765037	0,001	6399	168423	1021	0,001	775	430159
CB 029	Graf 172	3/4	Oudenburg	908	69178	1,04E+06	1670	0,001	8827	3076	160897	34856	1,71E+07	816296	0,001	6434	175855	1002	0,001	859	623637
CB 029	Graf 172	3/4	Oudenburg	0,001	41614	1,31E+06	526	0,001	9820	1720	151102	25506	1,78E+07	692486	0,001	7935	115164	1013	0,001	539	477650
CB 030	Graf 188	3/4	Oudenburg	1750	51643	253817	2203	12387	0,001	41476	94379	35941	1,90E+07	343233	7971	6802	215327	1014	0,001	176	257649
CB 030	Graf 188	3/4	Oudenburg	1059	48642	223651	827	0,001	13056	9610	145398	46710	1,96E+07	309652	1807	6522	192606	863	0,001	728	100982
CB 030	Graf 188	3/4	Oudenburg	490	44371	203788	1142	4616	2713	36935	131029	32568	1,93E+07	305960	10775	6234	163347	775	0,001	810	283629
CB 031	Graf 190	3/4	Oudenburg	2379	78369	281063	4329	0,001	14055	209	243712	25803	1,77E+07	786818	0,001	19262	267044	1907	0,001	440	503523

CB 031	Graf 190	3/4	Oudenburg	1790	38969	172505	1998	2978	848	20843	742154	39475	1,62E+07	747684	1937	16484	212034	1550	0,001	1006	1,03E+06
CB 031	Graf 190	3/4	Oudenburg	0,001	51147	229753	932	2338	2674	31485	154469	27265	1,84E+07	486974	29290	9887	215525	1445	0,001	993	639072
CB 031	Graf 190	3/4	Oudenburg	1375	82370	274994	2451	0,001	6918	4252	221184	21091	1,83E+07	536632	1761	8874	226066	1408	0,001	327	435900
CB 032	Graf 206	2	Oudenburg	380	65088	185807	2878	18254	2438	32602	126088	62590	1,67E+07	715810	2773	9612	151522	870	0,001	392	675839
CB 032	Graf 206	2	Oudenburg	3921	48288	190118	1686	0,001	16355	898	167748	23932	1,71E+07	732273	0,001	10277	164809	954	0,001	458	1,03E+06
CB 032	Graf 206	2	Oudenburg	0,001	36039	149140	632	6086	1577	22789	114703	34563	1,84E+07	529594	10332	5866	134410	1181	0,001	780	571806
CB 033	Verhelst	3/4	Oudenburg	0,001	20176	40077	4161	4346	6593	4836	740726	60794	1,60E+07	2,29E+06	49023	2340	27436	230	0,001	1003	543548
CB 033	Verhelst	3/4	Oudenburg	2457	11591	112155	1992	4114	286	19097	400313	32509	1,77E+07	1,76E+06	30437	1920	11239	42	0,001	1297	313375
CB 034	KL17	1	Oudenburg	778	74939	268539	6615	0,001	10864	6711	173827	26958	1,63E+07	204282	0,001	7062	296906	2477	0,001	2513	1,23E+06
CB 034	KL17	1	Oudenburg	7296	24455	102605	12299	0,001	3942	5804	804666	29236	1,53E+07	136743	10443	4459	175967	1580	0,001	3244	1,67E+06
CB 034	KL17	1	Oudenburg	15178	58819	410091	5538	0,001	0,001	7874	852010	32568	1,58E+07	143288	0,001	10319	384970	2825	0,001	1230	1,16E+06
CB 034	KL17	1	Oudenburg	9383	34225	172271	14736	1147	7120	13050	1,54E+06	40186	1,59E+07	166496	0,001	5529	239051	1121	0,001	497	1,04E+06
CB 035	KL90	1	Oudenburg	17726	54245	585286	8159	947	179	6222	1,06E+06	42262	1,41E+07	56332	0,001	5033	200136	1040	0,001	2465	1,90E+06
CB 036	KL91	1	Oudenburg	18329	17177	188002	8037	0,001	4074	3120	801436	19887	1,44E+07	439671	37337	2303	18871	156	0,001	5048	2,18E+06
CB 037	KL92	5	Oudenburg	6372	70200	58493	7634	11251	23530	14697	277915	111282	1,42E+07	479817	0,001	7489	84188	1398	0,001	6692	488609
CB 037	KL92	5	Oudenburg	237	70927	111161	12716	18397	13098	23785	202615	84817	1,58E+07	842260	0,001	8833	117032	2260	0,001	4981	521632
CB 037	KL92	5	Oudenburg	17170	14924	59060	14252	1769	6236	331	180169	34989	1,91E+07	190341	10056	2658	58902	1094	0,001	2763	497640
CB 037	KL92	5	Oudenburg	4178	21932	212776	1306	8937	0,001	7673	324745	52901	1,71E+07	621828	0,001	2776	26863	422	0,001	1460	790803
CB 037	KL92	5	Oudenburg	17222	11317	135008	776	5826	343	2821	197036	48363	1,91E+07	576230	0,001	1994	7709	19	0,001	1884	265747
CB 038	KL93	2	Oudenburg	24295	18726	305752	3237	2995	385	3407	214100	39839	1,47E+07	986457	0,001	1699	10427	132	0,001	3170	1,98E+06
CB 038	KL93	2	Oudenburg	39025	32482	732038	11150	2003	3276	17360	548616	31216	1,60E+07	1,53E+06	0,001	2606	1134	217	0,001	1896	910051
CB 038	KL93	2	Oudenburg	1181	13624	53175	3534	0,001	23757	2185	156244	34003	1,84E+07	1,52E+06	22065	2166	3567	1283	0,001	1634	435221
CB 038	KL93	2	Oudenburg	0,001	17010	32301	2081	0,001	24088	1505	156939	33089	1,80E+07	1,63E+06	20100	1948	4049	1241	0,001	1519	393414
CB 039	KL94	0	Oudenburg	83813	35976	90293	17260	3514	1958	3849	345458	31249	1,98E+07	117313	0,001	5804	8550	166	0,001	1812	198122
CB 039	KL94	0	Oudenburg	61505	28956	108223	15564	4265	9505	6530	1,62E+06	24195	1,76E+07	76703	0,001	6710	3620	128	0,001	1862	428048
CB 039	KL94	0	Oudenburg	19979	8040	37259	4104	2006	4195	5959	1,01E+06	33417	1,89E+07	171555	1753	5267	34952	457	0,001	1690	292111
CB 039	KL94	0	Oudenburg	83885	34872	104210	14829	3262	1578	2737	466947	31297	1,95E+07	118003	0,001	6294	4684	121	0,001	2219	191415
CB 040	KL95	2	Oudenburg	10608	15841	42300	18183	0,001	14943	0,001	202646	20204	1,73E+07	73923	28533	3251	63166	793	0,001	3557	1,58E+06
CB 040	KL95	2	Oudenburg	11108	71703	336127	12373	0,001	1057	0,001	181730	27795	1,37E+07	497381	0,001	12756	271617	4421	0,001	3802	2,42E+06
CB 040	KL95	2	Oudenburg	5850	70468	173381	6480	2654	8320	11509	676128	67046	1,13E+07	457062	0,001	6356	62651	727	0,001	4507	1,91E+06

CB 040	KL95	2	Oudenburg	5228	28185	279071	2770	7209	269	4991	638243	42391	1,59E+07	280018	0,001	4410	97128	1300	0,001	3443	1,64E+06
CB 040	KL95	2	Oudenburg	6937	27307	66262	4855	6861	7103	1046	449817	44501	1,45E+07	112177	52696	3638	73634	875	0,001	3465	2,45E+06
CB 040	KL95	2	Oudenburg	6580	66299	291352	7972	0,001	2712	0,001	207524	52247	1,37E+07	476803	26446	22452	231622	3910	0,001	3968	2,41E+06
CB 041	KL96	0	Oudenburg	5421	88537	426549	5231	0,001	4890	13488	1,42E+06	33441	1,60E+07	27902	0,001	6146	301627	1611	463	370	883157
CB 041	KL96	0	Oudenburg	3817	44694	218373	10228	0,001	12200	9475	715014	27193	1,69E+07	44492	0,001	7626	335118	1935	0,001	856	1,11E+06
CB 041	KL96	0	Oudenburg	9674	90480	410533	9790	0,001	4117	12939	1,46E+06	34151	1,47E+07	37175	0,001	6317	305638	1857	339	499	1,42E+06
CB 042	KL97	0	Oudenburg	8558	29785	382306	5834	2667	3730	17001	807963	33762	1,46E+07	84107	0,001	2180	46831	374	0,001	4015	2,22E+06
CB 042	KL97	0	Oudenburg	12859	29571	360407	9475	3586	7794	11936	474034	32276	1,59E+07	49489	0,001	2724	116695	641	0,001	3563	2,01E+06
CB 043	KL98	0	Oudenburg	32595	46121	231164	12547	0,001	12790	3625	224863	38944	1,40E+07	48834	0,001	6047	203924	4256	0,001	4728	2,55E+06
CB 043	KL98	0	Oudenburg	6993	59916	357720	10578	0,001	5966	5722	391418	56517	1,47E+07	37054	0,001	6144	277032	5000	0,001	2922	1,95E+06
CB 043	KL98	0	Oudenburg	19197	58423	426433	10042	0,001	10398	3501	167692	18396	1,53E+07	45143	0,001	8053	311562	6390	0,001	3805	1,93E+06
CB 044	KL99	0	Oudenburg	16739	28529	135251	5579	110	1262	6404	1,36E+06	32434	1,78E+07	180939	1965	4852	85837	1694	0,001	2557	467912
CB 045	KL107	0	Oudenburg	43294	43872	238914	10432	489	7681	1362	382309	29969	1,68E+07	77629	0,001	4771	125945	1057	0,001	2170	1,38E+06
CB 045	KL107	0	Oudenburg	12930	47730	186036	9668	0,001	8628	0,001	313079	34074	1,28E+07	111372	24591	4275	197288	1761	0,001	5643	3,02E+06
CB 045	KL107	0	Oudenburg	30751	34575	201373	8911	0,001	7749	2985	375403	25652	1,66E+07	75837	0,001	3936	115141	840	0,001	4242	1,44E+06
CB 047	KL110	0	Oudenburg	6162	32786	147934	3692	0,001	7381	0,001	226376	23405	1,74E+07	37888	0,001	8190	300092	2843	0,001	3120	1,05E+06
CB 047	KL110	0	Oudenburg	31989	17069	238967	6623	4667	7851	12071	1,91E+06	25221	1,76E+07	34563	0,001	5818	9209	0,001	0,001	1698	454110
CB 047	KL110	0	Oudenburg	23658	9083	132322	7980	1790	8860	10330	765672	35020	1,76E+07	43056	0,001	3140	2738	0,001	0,001	2266	946305
CB 048	KL111	0	Oudenburg	35878	52647	305531	15453	0,001	6716	2842	355002	29521	1,72E+07	68003	0,001	6960	196300	1380	0,001	1084	939754
CB 048	KL111	0	Oudenburg	73411	32620	131287	13541	3989	3940	10405	453859	32754	1,73E+07	67624	0,001	3065	11552	8	0,001	2402	1,07E+06
CB 048	KL111	0	Oudenburg	2085	15877	121835	733	0,001	0,001	4068	211973	27592	1,68E+07	38035	0,001	6496	204530	816	0,001	3815	1,54E+06
CB 048	KL111	0	Oudenburg	39815	31581	142511	9333	2271	3005	12316	896704	40198	1,67E+07	56401	0,001	4012	39522	244	0,001	2019	1,22E+06
CB 049	KL112	0	Oudenburg	17603	10940	88046	2418	3769	3566	9679	681050	33831	1,86E+07	21640	0,001	4868	68628	785	0,001	3337	623464
CB 049	KL112	0	Oudenburg	21892	7231	21816	5581	4651	6052	12063	810245	28699	1,86E+07	20052	0,001	5831	9927	191	0,001	5186	689925
CB 049	KL112	0	Oudenburg	24002	19248	83971	5274	43	3300	6642	612800	32980	1,83E+07	22125	0,001	5578	112134	1441	0,001	3289	642438
CB 049	KL112	0	Oudenburg	9664	4682	14655	3548	3851	7885	13693	982208	23789	1,82E+07	17953	3123	5994	25499	186	0,001	5748	588616
CB 050	412	3/4	Tongeren	3984	22927	89619	8534	2874	9271	7865	406888	33092	1,47E+07	3,10E+06	0,001	3721	30414	0,001	0,001	1716	924192
CB 050	412	3/4	Tongeren	0,001	10553	38383	3110	754	7102	4425	489297	36884	1,58E+07	2,56E+06	0,001	3950	34209	9	0,001	3105	930876
CB 052	4070 C	0	Tongeren	17581	209503	1,03E+06	14588	0,001	6927	9376	102334	54323	1,42E+07	62061	0,001	13912	391242	7787	3912	2150	1,63E+06
CB 052	4070 C	0	Tongeren	11366	133799	597047	10539	0,001	8821	6801	92391	34425	1,54E+07	37469	0,001	9629	276196	6282	2434	1872	1,65E+06

CB 052	4070 C	0	Tongeren	27430	318430	1,57E+06	21630	0,001	14506	17249	341352	62269	1,31E+07	89870	54561	18643	898532	5854	5093	426	248282
CB 053	74.A.2	0	Tongeren	8204	77443	204074	28175	8373	71178	46066	518230	78734	1,58E+07	648184	9284	8173	117598	2579	0,001	782	330658
CB 054	74.A.35	2	Tongeren	2411	60352	215368	6367	0,001	5526	3037	111810	26174	1,92E+07	268767	21241	27011	68576	2499	154306	21989	86051
CB 054	74.A.35	2	Tongeren	4908	104410	591976	7242	0,001	0,001	0,001	193207	36709	1,80E+07	193336	23124	51109	134604	3284	337332	40110	183779
CB 054	74.A.35	2	Tongeren	0,001	17698	22765	4922	0,001	1280	3542	98650	26381	1,84E+07	866828	15476	17116	29000	1002	522660	75607	48602
CB 055	74.A.5	3/4	Tongeren	3084	31407	453012	2912	0,001	946	17901	255412	31838	1,65E+07	2,07E+06	34855	2355	8678	1	0,001	2020	483573
CB 055	74.A.5	3/4	Tongeren	48	71001	278482	2692	0,001	345	12611	265522	55037	1,51E+07	2,90E+06	28693	3265	20493	138	0,001	914	691270
CB 055	74.A.5	3/4	Tongeren	5139	29606	211150	7384	0,001	1485	15271	241799	36508	1,61E+07	2,45E+06	0,001	2464	14578	40	0,001	645	615470
CB 056	GRM1376	3/4	Tongeren	9809	41806	166382	11417	0,001	2231	6062	193937	50307	1,53E+07	27810	0,001	4283	270849	203	0,001	3096	2,19E+06
CB 057	GRM1377	3/4	Tongeren	15544	164210	632011	11004	2541	3834	19341	149069	35549	1,57E+07	206781	19409	11552	364742	2691	0,001	1109	1,26E+06
CB 057	GRM1377	3/4	Tongeren	33175	268836	737568	19326	0,001	6047	5670	366059	27986	1,48E+07	182902	24470	13272	422980	3100	1513	1467	1,58E+06
CB 058	GRM1378	3/4	Tongeren	16459	47212	303806	15892	6095	12305	9716	335412	26369	1,65E+07	2,47E+06	0,001	2122	3791	5	0,001	0,001	512525
CB 058	GRM1378	3/4	Tongeren	8563	37837	100709	11878	189	7830	5127	282096	26698	1,50E+07	3,99E+06	13959	1918	3591	14	0,001	70	457414
CB 058	GRM1378	3/4	Tongeren	14800	45727	793302	11601	6149	8535	10433	384847	30403	1,62E+07	1,48E+06	0,001	2151	3710	17	0,001	601	800191
CB 058	GRM1378	3/4	Tongeren	11297	26394	480334	10608	5598	11389	8279	281469	32215	1,69E+07	1,43E+06	0,001	2008	3046	102	0,001	656	685755
CB 059	GRM1379	2	Tongeren	31395	42440	180617	12944	0,001	10282	2351	764021	25451	1,56E+07	1,29E+06	40713	3364	2659	35	0,001	1485	1,24E+06
CB 059	GRM1379	2	Tongeren	15005	38899	152150	12748	3796	2854	10793	1,02E+06	32765	1,50E+07	1,14E+06	35607	4047	5782	217	0,001	2241	1,43E+06
CB 061	Sc109	5	Tongeren	22600	46333	155680	8674	0,001	0,001	5438	466331	31118	1,88E+07	68206	60281	7982	47585	1730	208	603	509026
CB 061	Sc109	5	Tongeren	7315	146056	270370	20470	333	27248	10221	642174	85555	1,28E+07	92224	97235	18117	100966	1833	386490	3283	869046
CB 061	Sc109	5	Tongeren	12959	40973	150655	6245	0,001	457	6150	369089	27597	1,90E+07	55162	39238	7268	53393	1502	0,001	34	496040
CB 064	RV-Ou	2	Oudenburg	5583	94124	41182	16890	5386	58021	10151	348974	92852	5,19E+06	154314	36572	3838	1009	188	0,001	3593	595773
CB 064	RV-Ou	2	Oudenburg	70056	93653	451059	15443	8043	2738	1612	580994	23931	1,37E+07	839796	0,001	3950	135454	2320	0,001	1990	2,17E+06
CB 066	RV-To	2	Tongeren	64972	106765	355268	19257	24805	8442	1233	276034	58791	1,31E+07	42890	77417	17911	166804	23294	0,001	3081	2,81E+06
CB 067	RMOL03	5	Ravenstein	18527	65795	93795	2328	0,001	21849	2727	348304	11107	2,01E+07	33484	5045	74041	69850	884	11833	23844	19005
CB 067	RMOL03	5	Ravenstein	0,001	82047	102196	3034	16308	92	62154	321068	22346	1,89E+07	29494	9857	364786	56330	779	72998	84780	17095
CB 067	RMOL03	5	Ravenstein	1749	92163	185387	0,001	0,001	10289	25111	376993	23574	1,95E+07	33322	11567	116681	64089	894	107415	3766	26371
CB 067	RMOL03	5	Ravenstein	0,001	46032	79822	0,001	4415	5289	27909	185825	38545	1,89E+07	747029	166	3235	58720	1397	0,001	2305	69820
CB 068	RMOL04	3/4	Nijmegen	0,001	52633	75243	3769	1920	8726	23882	170749	47560	1,71E+07	1,51E+06	28036	3646	31925	905	0,001	2170	158211
CB 069	RMOL05	3/4	Maasdriel	0,001	27806	73748	0,001	6754	497	41110	176578	27037	1,85E+07	1,53E+06	12925	4327	33568	468	0,001	919	63773
CB 069	RMOL05	3/4	Maasdriel	1926	30263	83473	0,001	8002	0,001	52635	258387	22210	1,73E+07	2,43E+06	5298	4517	32946	257	0,001	1550	38162

CB 069	RMOL05	3/4	Maasdriel	0,001	25362	52288	0,001	2047	1712	25726	166761	25518	1,77E+07	2,82E+06	3007	4966	15155	173	0,001	1150	40888
CB 069	RMOL05	3/4	Maasdriel	0,001	33041	49965	0,001	0,001	17623	9325	153876	28659	2,00E+07	494459	16134	3635	32917	428	0,001	620	81049
CB 070	RMOL06	2	Nijmegen	14812	93822	430270	8415	1287	0,001	18360	676552	33456	1,50E+07	1,15E+06	22409	5559	181526	2285	0,001	1761	1,29E+06
CB 070	RMOL06	2	Nijmegen	12501	105851	285875	8481	0,001	1996	8020	381375	47187	1,48E+07	1,82E+06	26932	9333	86418	1369	0,001	1663	964702
CB 071	RMOL07	1	Nijmegen	56980	202029	332950	29867	0,001	7092	5144	547285	18609	1,55E+07	504315	2637	6414	297024	2077	0,001	565	1,33E+06
CB 072	RMOL08	3/4	Nijmegen	18306	93160	191292	11645	0,001	7081	8522	1,16E+06	31823	1,81E+07	139205	154876	5852	75308	1150	146095	14785	198696
CB 072	RMOL08	3/4	Nijmegen	10791	85670	173240	25509	3511	15846	18520	947947	71253	1,69E+07	127484	65366	7486	43478	677	97471	12999	138254
CB 072	RMOL08	3/4	Nijmegen	11755	74716	194425	13569	0,001	3755	12481	899234	41339	1,86E+07	106254	126179	8607	70931	1668	151286	21771	149516
CB 072	RMOL08	3/4	Nijmegen	16913	73817	247924	11386	0,001	1704	4627	1,95E+06	21600	1,69E+07	136166	235294	6809	118551	1558	37196	13910	338912
CB 073	RMOL25	3/4	Wijk-bij-Duurstede	29	11728	111566	355	0,001	1202	3616	357639	30761	1,55E+07	995583	67362	5804	26457	820	0,001	1359	779355
CB 073	RMOL25	3/4	Wijk-bij-Duurstede	3085	15191	116254	39	0,001	2116	0,001	315362	15155	1,26E+07	881842	52158	7447	39890	1148	0,001	1848	1,64E+06
CB 074	RMOL26	1	Wijk-bij-Duurstede	2363	25140	368151	14880	0,001	13963	44694	1,68E+06	21897	1,87E+07	20691	79296	7294	63406	3030	129	337	44807
CB 075	RMOL29	2	Wijk-bij-Duurstede	745	15986	72619	10775	0,001	17009	0,001	177043	22467	1,88E+07	294659	27560	3336	82372	861	0,001	1999	819751
CB 076	RMOL31	1	Maasdriel	4080	62510	165164	3204	0,001	8364	39480	534898	22798	1,97E+07	25594	0,001	8296	96605	1216	908	882	267896
CB 076	RMOL31	1	Maasdriel	2346	57718	168956	1020	0,001	16966	28185	304718	28702	2,00E+07	24718	0,001	7347	92375	1024	508	439	256087
CB 077	RMOL32	3/4	Maasdriel	0,001	54047	89140	0,001	11675	0,001	56301	319492	20850	2,02E+07	66519	8118	53241	33002	975	9952	966	17761
CB 077	RMOL32	3/4	Maasdriel	1233	47391	85759	846	0,001	15961	2381	284426	15381	1,93E+07	63837	6152	20900	31874	711	1045	872	22163
CB 078	RMOL36	1	Nijmegen	44249	74122	385731	15008	0,001	983	11281	714647	32983	1,66E+07	38920	0,001	40615	433701	1925	0,001	0,001	1,08E+06
CB 079	RMOL37	2	Nijmegen	7199	42921	158326	5156	5054	3613	3312	174672	74682	1,80E+07	92409	280837	7216	59706	1570	141713	18902	665850
CB 079	RMOL37	2	Nijmegen	9660	62742	186683	18588	3289	6413	0,001	219985	48548	1,66E+07	108401	262213	7712	62534	1590	373755	58833	924955
CB 079	RMOL37	2	Nijmegen	5703	50353	103341	3327	0,001	13479	0,001	140026	83239	1,95E+07	97803	164971	4938	56030	1239	0,001	539	503901
CB 080	RMOL38	0	Nijmegen	3926	38453	259126	3404	0,001	8072	8110	85702	25114	1,60E+07	1,80E+06	0,001	4340	158033	1225	0,001	651	1,09E+06
CB 080	RMOL38	0	Nijmegen	4937	33707	371799	2320	0,001	8419	8094	91075	35504	1,54E+07	2,03E+06	10399	4315	164068	1377	0,001	966	1,16E+06
CB 080	RMOL38	0	Nijmegen	24558	49028	195813	11415	0,001	6201	10207	235184	50542	1,43E+07	1,43E+06	0,001	5244	170781	1630	0,001	190	1,64E+06
CB 081	RMOL39	0	Nijmegen	18980	254270	1,34E+06	26240	0,001	8151	9597	268212	40818	1,54E+07	76947	0,001	9768	562474	1702	542	318	599927
CB 081	RMOL39	0	Nijmegen	5779	47509	263736	8595	0,001	7643	891	313965	28067	1,77E+07	35832	0,001	6060	299948	1478	0,001	1075	768735
CB 081	RMOL39	0	Nijmegen	13083	166171	905010	15494	0,001	613	7419	509996	44410	1,58E+07	49249	20440	12587	556794	4364	2080	944	199539

CB 083	RMOL41	0	Nijmegen	28206	226493	1,11E+06	25490	0,001	12121	6822	328380	45549	1,34E+07	56147	0,001	12221	713322	3091	414	1518	1,60E+06
CB 083	RMOL41	0	Nijmegen	25159	197326	813482	20429	0,001	15890	4222	293381	33087	1,48E+07	58167	0,001	9268	531770	2132	0,001	1542	1,37E+06
CB 084	RMOL42	1	Nijmegen	43695	193054	763267	490364	19519	943	1820	314183	36949	1,34E+07	349024	0,001	23881	317271	1858	0,001	2117	1,88E+06
CB 084	RMOL42	1	Nijmegen	27832	167510	764534	49027	1683	1527	3990	282499	41181	1,45E+07	336526	2044	19105	253111	1768	0,001	2537	1,59E+06
CB 084	RMOL42	1	Nijmegen	8328	95852	302542	56383	2578	2192	13419	160115	31158	1,73E+07	383988	0,001	10065	141283	996	0,001	530	895965
CB 086	RMOL44	0	Alphen aan de Rijn	16396	71685	314211	19139	0,001	22573	1451	455038	25314	1,75E+07	756828	0,001	5448	82386	747	0,001	1015	257455
CB 088	RMOL47	0	Wijk-bij-Duurstede	7702	195724	887671	11060	0,001	11816	16310	573310	38000	1,55E+07	528260	0,001	36123	624367	3085	0,001	0,001	755396
CB 090	Nij 07	1	Nijmegen	0,001	8145	163029	6296	0,001	4925	3061	228178	39787	1,71E+07	663249	22625	11128	140821	1088	0,001	3108	1,19E+06
CB 091	Nij 08	2	Nijmegen	15615	107649	390336	21389	2788	5307	14903	397770	63570	1,27E+07	81740	38814	9111	224476	2089	27677	1063	2,34E+06
CB 097	Nij 14	1	Nijmegen	48742	60000	420921	18842	4874	4503	26131	1,37E+06	31971	1,81E+07	30920	0,001	4904	35229	520	0,001	1597	267941
CB 097	Nij 14	1	Nijmegen	27941	114895	634298	18634	8906	16261	47464	1,83E+06	57849	1,61E+07	27952	0,001	7655	55582	1012	0,001	1803	224339
CB 098	Nij 15	1	Nijmegen	84211	68334	496180	34491	6295	2807	28116	1,29E+06	29506	1,61E+07	325638	0,001	5842	37827	136	0,001	0,001	812422
CB 098	Nij 15	1	Nijmegen	3078	24169	175916	0,001	1601	3096	0,001	110762	33750	1,84E+07	86324	0,001	9161	443401	2274	0,001	2980	410337
CB 098	Nij 15	1	Nijmegen	58820	53783	378043	21056	5673	4520	25482	592235	28724	1,75E+07	408945	0,001	5109	137167	571	0,001	0,001	468473
CB 100	Nij 17	3/4	Nijmegen	63775	75727	709345	28114	6153	4492	26691	1,02E+06	26010	1,54E+07	1,55E+06	0,001	23511	29210	506	0,001	0,001	535003
CB 108	Nij 25	2	Nijmegen	57899	73110	755342	21804	6113	4578	39851	1,30E+06	32936	1,46E+07	145490	0,001	8235	189809	1084	0,001	0,001	1,59E+06
CB 109	Nij 26	6	Nijmegen	52648	74222	780513	17459	0,001	0,001	13732	535538	23733	1,46E+07	30481	77264	17788	25917	2042	486310	50074	1,46E+06
CB 109	Nij 26	6	Nijmegen	53912	73814	707003	19474	256	0,001	13609	549578	25692	1,35E+07	28889	167325	19697	50992	1837	603847	60875	1,88E+06
CB 115	Nij 32	6	Nijmegen	21941	78162	727037	8024	0,001	0,001	2716	719498	45006	1,65E+07	1,69E+06	11808	7785	112389	300	33795	2110	203551
CB 116	Nij 33	1	Nijmegen	28189	176043	965351	11033	0,001	0,001	7181	200392	35930	1,40E+07	152026	0,001	68965	1,02E+06	587	0,001	2547	1,24E+06
CB 116	Nij 33	1	Nijmegen	5698	77064	249704	11788	278	34125	15684	594873	93547	1,41E+07	225358	0,001	8022	139309	446	0,001	2369	841389
CB 118	Nij 36	1	Nijmegen	189678	96752	951982	34798	14358	3140	51307	1,76E+06	23874	1,49E+07	37010	0,001	10795	88409	2140	0,001	1575	702981
CB 121	Nij 41	1	Nijmegen	4030	67260	338267	6344	3409	2652	22944	227052	46928	1,57E+07	332444	0,001	5003	222386	1533	0,001	1896	1,48E+06
CB 122	Nij 42	3/4	Nijmegen	50078	54578	523483	28506	4401	3565	36007	905058	23406	1,53E+07	189664	0,001	3844	55473	950	0,001	0,001	1,76E+06
CB 122	Nij 42	3/4	Nijmegen	19144	31769	584546	13306	3069	3635	27056	1,01E+06	26369	1,67E+07	188210	0,001	4745	46856	720	0,001	252	1,24E+06
CB 123	Nij 43	2	Nijmegen	37640	101021	672984	20188	0,001	105	25381	419196	43754	1,44E+07	479055	0,001	9612	219775	3039	0,001	2203	1,79E+06
CB 126	Nij 46	3/4	Nijmegen	0,001	71441	256860	11230	1519	32905	8483	311776	107175	1,06E+07	55752	0,001	16137	8583	177	765	8551	2,58E+06
CB 126	Nij 46	3/4	Nijmegen	6712	16336	135613	4023	1010	1118	0,001	63766	36105	1,45E+07	40399	78567	3141	101340	931	0,001	4223	2,75E+06
CB 127	Nij 47	2	Nijmegen	19797	57599	744232	17094	356	0,001	19220	1,40E+06	37060	1,46E+07	284458	0,001	13810	244724	1025	0,001	563	1,35E+06

CB 128	Nij 48	3/4	Nijmegen	10479	79809	234419	12075	0,001	1573	1976	299787	42330	1,31E+07	424768	10176	11900	149746	1977	0,001	2930	2,84E+06
CB 129	Nij 49	3/4	Nijmegen	14411	96052	482653	26494	4085	9841	10409	637986	64880	1,41E+07	1,85E+06	0,001	11674	14868	561	0,001	2135	808734
CB 129	Nij 49	3/4	Nijmegen	11564	26662	186960	12372	0,001	10275	3170	395927	25276	1,75E+07	1,36E+06	0,001	3859	27699	819	0,001	1322	578821
CB 129	Nij 49	3/4	Nijmegen	6717	143868	470339	21306	679	31019	11921	507639	87538	1,51E+07	346226	40212	14000	139200	3085	0,001	7237	83836
CB 130	Nij 50	2	Nijmegen	9649	134453	851925	11605	0,001	193	12223	295679	47020	1,50E+07	1,05E+06	0,001	13077	415937	3185	0,001	3070	833881
CB 130	Nij 50	2	Nijmegen	6316	155340	1,11E+06	12020	0,001	0,001	2641	420356	35121	1,35E+07	642946	0,001	20669	663250	4584	0,001	4717	1,40E+06
CB 135	KAM 04	3/4	Nijmegen	0,001	47520	596376	0,001	0,001	15701	5251	238484	20013	1,69E+07	2,04E+06	0,001	10108	91836	1781	0,001	324	564716
CB 135	KAM 04	3/4	Nijmegen	0,001	30738	623516	0,001	9865	1087	42324	152792	35666	1,66E+07	1,51E+06	17146	8369	76174	1299	0,001	1633	695611
CB 135	KAM 04	3/4	Nijmegen	837	50314	809733	2875	0,001	14549	1756	210671	22742	1,73E+07	1,54E+06	0,001	9267	84394	1448	0,001	469	480059
CB 136	KAM 05	1	Nijmegen	7098	48702	1,51E+06	3216	0,001	7224	7752	531782	26025	1,48E+07	545822	0,001	6099	135283	1253	0,001	1244	1,45E+06
CB 137	KAM 06	1	Nijmegen	0,001	19390	852359	254	0,001	7539	11976	476068	27593	1,62E+07	1,97E+06	2024	8551	50746	1078	0,001	901	635749
CB 137	KAM 06	1	Nijmegen	348	32928	904544	1489	0,001	13684	4614	489457	28466	1,59E+07	1,89E+06	0,001	8809	60526	937	0,001	516	774560
CB 137	KAM 06	1	Nijmegen	1131	28031	739585	0,001	0,001	13297	3278	480763	18764	1,54E+07	2,52E+06	0,001	9167	54371	1193	0,001	348	817582
CB 138	KAM 07	1	Nijmegen	1041	40193	1,55E+06	1221	0,001	8321	5793	319208	27064	1,63E+07	1,27E+06	16014	5285	166985	2899	0,001	720	448481
CB 138	KAM 07	1	Nijmegen	661	52863	1,08E+06	2239	0,001	12236	3976	343540	26023	1,75E+07	760187	0,001	6312	193492	3212	0,001	532	321074
CB 138	KAM 07	1	Nijmegen	937	50981	635293	1605	0,001	14820	2401	368612	19159	1,77E+07	1,07E+06	0,001	5880	161501	2895	0,001	404	346599
CB 139	KAM 08	2	Nijmegen	12582	45552	1,27E+06	5326	2056	2231	18165	688725	22760	1,71E+07	339577	8837	84461	66188	791	302218	50243	125849
CB 139	KAM 08	2	Nijmegen	2150	37630	1,89E+06	186	0,001	11809	6416	442671	15460	1,77E+07	537377	1170	5258	84696	1043	0,001	0,001	257159
CB 139	KAM 08	2	Nijmegen	0,001	27413	1,91E+06	0,001	0,001	2129	17170	373083	24010	1,77E+07	319915	10099	5444	57230	964	0,001	305	262191
CB 140	KAM 09	1	Nijmegen	3718	62175	883191	5472	0,001	9256	8757	307475	25648	1,70E+07	816206	72868	4544	225373	1601	0,001	1068	634283
CB 141	KAM 10	3/4	Nijmegen	2860	19991	916731	7889	0,001	12445	1421	127204	24072	1,84E+07	589470	0,001	2229	23798	132	0,001	266	351053
CB 141	KAM 10	3/4	Nijmegen	3022	26203	508558	2436	0,001	12136	3085	191882	24684	1,79E+07	1,80E+06	0,001	3021	25473	174	0,001	282	408958
CB 141	KAM 10	3/4	Nijmegen	0,001	25005	1,76E+06	0,001	0,001	10484	2025	155764	16657	1,76E+07	806201	0,001	2902	20311	171	0,001	179	548010
CB 142	KAM 11	3/4	Nijmegen	1609	14452	558416	0,001	0,001	8137	13508	311061	27520	1,80E+07	1,37E+06	363	6283	33693	497	0,001	407	363829
CB 142	KAM 11	3/4	Nijmegen	1485	29256	319226	0,001	0,001	16629	2835	296852	16950	1,84E+07	910714	0,001	10148	49229	895	0,001	554	530517
CB 142	KAM 11	3/4	Nijmegen	1302	23146	1,13E+06	73	0,001	11929	923	299275	17619	1,71E+07	789238	0,001	7870	45671	677	0,001	355	397812
CB 143	KAM 13	3/4	Nijmegen	6148	35344	690582	3338	4541	3848	19265	103311	41617	1,45E+07	604249	2816	19745	108784	732	0,001	3163	2,18E+06
CB 143	KAM 13	3/4	Nijmegen	9250	47171	884497	3994	0,001	8919	2106	137772	33108	1,45E+07	556904	0,001	19601	110119	602	0,001	2049	2,06E+06
CB 144	KAM 14	2	Nijmegen	39776	91314	230328	16681	0,001	1800	17943	436693	69944	1,76E+07	464625	17894	4624	146824	2511	0,001	227	729840
CB 144	KAM 14	2	Nijmegen	15138	105903	364165	9393	0,001	2325	19352	310980	89302	1,70E+07	620983	4065	6590	206512	3526	0,001	900	902237

CB 144	KAM 14	2	Nijmegen	9735	84480	247177	13544	0,001	16530	2486	344396	51276	1,84E+07	315361	0,001	6566	190934	3649	0,001	706	625469
CB 145	KAM 15	3/4	Nijmegen	42773	166674	862754	20068	0,001	390	11171	999071	35607	1,37E+07	392207	25725	10996	553750	1466	0,001	971	1,10E+06
CB 145	KAM 15	3/4	Nijmegen	12979	40705	52292	11200	1874	3086	15922	236232	28130	1,58E+07	3,54E+06	18738	5222	33078	162	0,001	2459	109150
CB 147	KAM 17	1	Nijmegen	11248	41804	1,25E+06	4368	1699	3773	18995	238372	35563	1,61E+07	1,18E+06	0,001	10468	156506	1270	0,001	1095	842964
CB 147	KAM 17	1	Nijmegen	7511	57301	1,36E+06	2727	0,001	9044	2032	224382	24657	1,49E+07	1,28E+06	0,001	14702	221149	1858	0,001	1226	1,12E+06
CB 148	KAM 18	3/4	Nijmegen	2164	23044	849340	1201	0,001	10422	7967	629868	24946	1,65E+07	733488	0,001	19073	37602	696	0,001	41	1,01E+06
CB 148	KAM 18	3/4	Nijmegen	4920	32498	1,44E+06	1688	0,001	8471	2878	262042	24712	1,56E+07	712905	0,001	18551	41498	758	0,001	1456	1,50E+06
CB 148	KAM 18	3/4	Nijmegen	1544	40291	678489	1767	0,001	13017	4229	338561	26196	1,67E+07	939732	0,001	10858	116133	1332	0,001	484	1,13E+06
CB 149	KAM 19	2	Nijmegen	0,001	90963	292298	6830	0,001	6955	566872	496098	30149	1,67E+07	1,76E+06	4892	5082	132797	1249	0,001	1879	113718
CB 149	KAM 19	2	Nijmegen	3353	114797	415062	6818	0,001	4530	1,05E+06	754164	24368	1,49E+07	1,58E+06	7704	6516	186129	1593	0,001	2434	147521
CB 149	KAM 19	2	Nijmegen	6370	124814	331102	16006	0,001	14980	649328	570774	29641	1,68E+07	1,52E+06	5696	5617	133056	1378	0,001	3416	95250
CB 150	KAM 20	3/4	Nijmegen	1138	36397	302206	50943	15896	0,001	0,001	235829	39255	1,45E+07	158871	0,001	14990	196630	1953	0,001	3227	1,67E+06
CB 150	KAM 20	3/4	Nijmegen	6875	35989	318067	5301	0,001	0,001	0,001	178020	30443	1,29E+07	287055	0,001	10425	216168	6161	0,001	4997	2,80E+06
CB 151	KAM 21	1	Nijmegen	7090	47558	911045	6845	0,001	9526	0,001	406235	6314	1,69E+07	1,07E+06	2460	34919	147840	1663	299286	43032	279469
CB 152	KAM 22	3/4	Nijmegen	0,001	26592	34912	11242	0,001	16372	2502	198270	34159	1,86E+07	1,25E+06	28356	3666	10355	697	0,001	1349	370745
CB 152	KAM 22	3/4	Nijmegen	2387	48765	77868	6573	429	4169	5536	425268	31725	1,83E+07	795608	31510	3983	13103	804	0,001	1024	474357
CB 152	KAM 22	3/4	Nijmegen	5040	66553	96214	13144	0,001	19906	823	326231	31888	1,83E+07	798583	19403	4235	12280	472	0,001	743	509764
CB 153	KAM 23	3/4	Nijmegen	12397	135891	571968	14481	704	10476	8683	271415	34550	1,95E+07	43014	52350	8550	32043	2038	174524	0,001	37522
CB 153	KAM 23	3/4	Nijmegen	3903	65369	182489	5161	0,001	16826	387	157563	26783	1,89E+07	32305	65366	4965	30314	2022	14542	132	30628
CB 153	KAM 23	3/4	Nijmegen	713	37818	80486	0,001	0,001	20546	0,001	169538	21420	1,88E+07	26638	62363	4587	25426	2114	3446	419	32362
CB 154	KAM 24	3/4	Nijmegen	2064	53331	1,05E+06	7218	12602	0,001	25030	274330	39088	1,43E+07	1,78E+06	0,001	4323	210877	2142	0,001	1868	1,14E+06
CB 154	KAM 24	3/4	Nijmegen	4797	67381	416391	11140	0,001	4007	11422	276448	29629	1,39E+07	1,14E+06	28370	5423	294186	3048	0,001	2911	1,93E+06
CB 154	KAM 24	3/4	Nijmegen	4713	69829	413517	7232	0,001	9476	3393	270119	24343	1,53E+07	1,08E+06	41118	5339	258339	2025	0,001	1412	1,53E+06
CB 155	KAM 25	1	Nijmegen	29024	214116	1,13E+06	18455	0,001	957	4477	107891	55191	1,35E+07	491290	0,001	16239	937776	2084	0,001	505	1,36E+06
CB 155	KAM 25	1	Nijmegen	24424	196397	1,01E+06	15451	0,001	1537	3295	102884	40260	1,36E+07	1,09E+06	0,001	13555	794758	1996	0,001	630	1,18E+06
CB 156	KAM 26	1	Nijmegen	3123	13290	95074	8527	0,001	3266	4178	232608	36023	1,86E+07	1,41E+06	9020	5261	38426	1197	0,001	1743	293061
CB 156	KAM 26	1	Nijmegen	4264	37174	168459	10221	0,001	9461	1184	171332	32463	1,58E+07	671587	26893	4476	33998	1239	0,001	3773	1,78E+06
CB 156	KAM 26	1	Nijmegen	2744	28320	104299	10333	0,001	9538	1046	205403	28119	1,80E+07	780756	44657	3168	41861	1922	0,001	2050	784663
CB 157	KAM 27	3/4	Nijmegen	5126	51146	203387	5762	3019	0,001	4192	677991	42611	1,44E+07	573348	21952	2607	4402	861	0,001	4198	2,09E+06
CB 157	KAM 27	3/4	Nijmegen	13397	58847	174187	8340	0,001	10557	2542	273355	38403	1,72E+07	905322	0,001	2782	3495	550	0,001	724	862684

CB 157	KAM 27	3/4	Nijmegen	4478	28640	99089	4689	1496	957	3339	349283	41249	1,65E+07	617636	15157	2056	3304	645	0,001	2381	1,41E+06
CB 159	KAM 30	2	Nijmegen	6083	277315	450568	8611	303	3578	3820	270768	30654	1,84E+07	40313	1970	8580	111385	2746	257324	2896	99454
CB 159	KAM 30	2	Nijmegen	552	108976	415936	10481	0,001	13802	0,001	137380	35346	1,56E+07	70336	36996	23129	89705	2304	1,05E+06	8551	689902
CB 160	KAM 31	3/4	Nijmegen	4164	33610	511143	3090	6314	2142	25868	151301	46002	1,53E+07	374076	21728	17847	76067	676	0,001	962	1,31E+06
CB 161	KAM 32	3/4	Nijmegen	0,001	22028	1,01E+06	1924	0,001	11649	4645	110856	20408	1,85E+07	356039	0,001	20129	32114	293	0,001	615	272490
CB 163	KAM 34	2	Nijmegen	22594	115566	295808	11980	0,001	5810	1332	366258	29722	1,47E+07	73787	38980	9263	201218	2015	7117	3191	2,29E+06
CB 163	KAM 34	2	Nijmegen	26681	144591	471566	9834	0,001	1015	2648	312276	34585	1,44E+07	220636	41508	10547	294448	2808	11987	828	2,06E+06
CB 164	KAM 35	3/4	Nijmegen	0,001	18752	564226	0,001	0,001	7461	12004	225184	24460	1,97E+07	269877	10957	14613	28583	1487	214	647	86381
CB 164	KAM 35	3/4	Nijmegen	0,001	18249	172465	1627	0,001	4547	13148	1,39E+06	21066	1,90E+07	354338	14757	11584	63536	1866	42452	8091	101644
CB 164	KAM 35	3/4	Nijmegen	3335	41408	357454	0,001	0,001	14585	0,001	172592	18450	1,95E+07	134952	0,001	12695	83600	958	0,001	423	266232
CB 165	KAM 36	6	Nijmegen	0,001	25880	1,48E+06	0,001	0,001	16480	0,001	194068	16847	1,79E+07	202418	10863	65392	26252	943	14474	0,001	91266
CB 165	KAM 36	6	Nijmegen	191	26865	1,89E+06	0,001	0,001	14263	0,001	182965	16238	1,82E+07	229585	8739	17994	30814	2003	24788	83	47173
CB 167	KAM 38	2	Nijmegen	30704	79550	179804	19088	0,001	4466	10990	823536	38820	1,68E+07	119485	0,001	12201	325992	1751	0,001	613	1,04E+06
CB 167	KAM 38	2	Nijmegen	13847	93568	354500	11212	0,001	7902	3967	276098	35468	1,61E+07	167962	0,001	12466	320074	1226	0,001	470	876779
CB 167	KAM 38	2	Nijmegen	52108	142043	382644	27849	0,001	0,001	25056	1,06E+06	34675	1,49E+07	217475	0,001	21720	521577	2343	0,001	0,001	1,34E+06
CB 168	KAM 39	1	Nijmegen	9444	68813	1,11E+06	4809	0,001	12293	3740	166956	36815	1,51E+07	624732	0,001	7009	189481	1129	0,001	1232	1,51E+06
CB 170	KAM 41	2	Nijmegen	0,001	34853	446961	0,001	0,001	15026	1872	104326	21129	1,87E+07	238973	18070	10545	48453	638	0,001	463	149741
CB 170	KAM 41	2	Nijmegen	0,001	29326	653515	0,001	0,001	9693	9239	73238	33862	1,99E+07	331571	12922	8390	50133	938	13281	1926	82616
CB 171	KAM 42	3/4	Nijmegen	4110	61291	239437	6309	0,001	1080	0,001	102800	40805	1,40E+07	1,33E+06	64104	5435	111508	229	0,001	3533	2,23E+06
CB 172	KAM 43	3/4	Nijmegen	0,001	12019	1,67E+06	0,001	4705	690	20494	238459	37960	1,74E+07	314239	0,001	1653	852	0,001	0,001	1010	712395
CB 172	KAM 43	3/4	Nijmegen	2296	20531	1,36E+06	5150	0,001	14631	2454	388980	27823	1,77E+07	584038	0,001	2004	983	19	0,001	538	667599
CB 173	KAM 44	2	Nijmegen	2847	49101	1,39E+06	3134	2067	2612	19835	89810	32573	1,59E+07	544192	0,001	4879	154996	1002	0,001	1831	1,25E+06
CB 173	KAM 44	2	Nijmegen	3119	53551	717088	2120	0,001	11555	7213	107828	30035	1,69E+07	431234	0,001	4636	151454	1112	0,001	1524	1,25E+06
CB 173	KAM 44	2	Nijmegen	5755	57496	967594	4318	0,001	11704	3212	345337	31348	1,52E+07	540140	0,001	7997	192155	1412	0,001	706	1,35E+06
CB 176	KAM 47	3/4	Nijmegen	2483	51512	280038	3347	0,001	11576	5524	174796	34221	1,72E+07	1,15E+06	0,001	8291	152976	1363	0,001	511	798630
CB 176	KAM 47	3/4	Nijmegen	1932	57570	969680	2703	0,001	10608	5648	220014	28247	1,73E+07	1,03E+06	0,001	8072	143971	1221	0,001	954	578254
CB 180	KAM 51	5	Nijmegen	63201	92818	396508	11446	0,001	0,001	10103	353670	57038	1,33E+07	382347	0,001	31155	443927	2904	0,001	1444	2,27E+06
CB 180	KAM 51	5	Nijmegen	28914	66117	200201	5930	0,001	0,001	1118	825688	40997	1,41E+07	109527	0,001	9360	269986	1798	0,001	3369	2,21E+06
CB 181	KAM 52	3/4	Beuningen	5656	26048	150793	4442	0,001	0,001	4755	145123	44045	1,32E+07	106827	0,001	7003	212021	2224	0,001	5274	3,20E+06
CB 182	KAM 53	2	Nijmegen	4049	63006	255467	1520	3020	1213	32059	129354	30415	1,86E+07	244785	0,001	9056	200432	1882	0,001	688	500547

CB 182	KAM 53	2	Nijmegen	4652	78136	255831	1727	0,001	18828	2136	181713	28472	1,83E+07	226249	0,001	9154	210198	2266	0,001	986	683666
CB 183	KAM 54	6	Nijmegen	8766	44325	116598	3737	0,001	8840	849	145576	42058	1,76E+07	43897	79464	4110	95367	2006	12849	1253	1,21E+06
CB 183	KAM 54	6	Nijmegen	7084	25003	75119	0,001	0,001	8938	2351	147536	35904	1,87E+07	41915	21147	3572	92133	1966	0,001	1235	701925
CB 183	KAM 54	6	Nijmegen	4252	27840	68243	9268	1825	4562	4103	147909	36721	1,65E+07	111498	100647	4037	96868	1923	254099	2303	1,46E+06
CB 184	KAM 55	1	Nijmegen	769	33143	133178	8926	1188	8495	26698	153357	35640	1,66E+07	135292	59922	13691	211072	1956	0,001	2004	1,50E+06
CB 184	KAM 55	1	Nijmegen	772	29234	124312	5281	2129	2938	17647	182211	31841	1,63E+07	667909	83276	8695	154863	2070	0,001	1723	1,26E+06
CB 185	KAM 56	2	Nijmegen	16750	33299	150022	6876	0,001	7265	39707	617080	30153	1,86E+07	99982	23407	5596	98612	604	545403	0,001	82640
CB 185	KAM 56	2	Nijmegen	25606	42877	170456	11683	0,001	8712	33251	332398	29357	1,89E+07	126585	27201	5657	164755	844	364727	0,001	76729
CB 186	KAM 57	3/4	Nijmegen	17821	74180	306151	7688	0,001	4490	263	1,18E+06	35726	1,45E+07	847632	87209	8999	215511	2729	0,001	1989	1,54E+06
CB 187	KAM 58	2	Nijmegen	36898	56267	218058	7357	0,001	4937	0,001	61089	26564	1,25E+07	22203	68315	17108	178870	3859	2147	5222	3,42E+06

Dimensional measurements

Supplementary dataset of the metric data: provided for each brooch are collection, an existing or given collection ID, a Low Countries Crossbow Brooches ID, the site where it was found, its major context, dating according to brooch typology, the type of crossbow brooch and the values of the measurements of the total dimensions and separate features in mm. Missing or incomplete data is marked: INDET = type unclear; * = no data due to the fragmented state; values marked in light grey are reliable estimations of the complete value of the remaining elements in case of damage which can be used; values marked in dark grey are the values of the remaining elements in case of damage which cannot reliably be estimated and should not be used.

Collection	Coll.ID	CB ID	Site		Context	Brooch type dating	Type	Length (mm)	Width (mm)	Height (mm)	Arm length (mm)	Bow length (mm)	Foot length (mm)	Knob diameter (mm)
RAM	Graf 001	1	Oudenburg	military	burial	325-410	3/4	67	47	26	11	30	42	13
RAM	Graf 002	2	Oudenburg	military	burial	325-410	3/4	63	59	30	15	30	39	13
RAM	Graf 014	3	Oudenburg	military	burial	300-365	2	70	52	27	12	32	44	15
RAM	Graf 019	4	Oudenburg	military	burial	325-410	3/4	73	50	27	12	30	33	13
RAM	Graf 020	5	Oudenburg	military	burial	325-410	3/4	86	46	28	11	34	42	11
RAM	Graf 026	6	Oudenburg	military	burial	325-410	3/4	96	67	32	20	35	50	17
RAM	Graf 027	7	Oudenburg	military	burial	325-410	3/4	84	55	32	16	38	53	15
RAM	Graf 034	8	Oudenburg	military	burial	325-410	3/4	74	45	27	11	29	37	11
RAM	Graf 037	9	Oudenburg	military	burial	300-365	2	109	74	40	19	53	49	18
RAM	Graf 041	10	Oudenburg	military	burial	300-365	2	69	46	26	12	34	31	11
RAM	Graf 042	11	Oudenburg	military	burial	325-410	3/4	65	36	29	8	29	40	15
RAM	Graf 049	12	Oudenburg	military	burial	375-410	6	72	54	25	14	33	31	12
RAM	Graf 057	13	Oudenburg	military	burial	325-410	3/4	76	58	*	*	*	*	*
RAM	Graf 059	14	Oudenburg	military	burial	300-365	2	72	49	25	11	33	33	12
RAM	Graf 072	15	Oudenburg	military	burial	325-410	3/4	79	46	26	12	32	38	12

RAM	Graf 083	16	Oudenburg	military	burial	325-410	3/4	71	51	26	12	34	42	12
RAM	Graf 103	17	Oudenburg	military	burial	325-410	3/4	69	38	23	8	28	34	11
RAM	Graf 104	18	Oudenburg	military	burial	325-410	3/4	70	43	25	11	28	31	11
RAM	Graf 111	19	Oudenburg	military	burial	375-410	6	74	51	26	14	30	38	14
RAM	Graf 114	20	Oudenburg	military	burial	325-410	3/4	90	55	27	12	33	46	13
RAM	Graf 115	21	Oudenburg	military	burial	325-410	3/4	78	49	27	13	34	40	11
RAM	Graf 124	22	Oudenburg	military	burial	375-410	6	90	54	31	15	35	49	14
RAM	Graf 129	23	Oudenburg	military	burial	325-410	3/4	75	50	28	11	31	35	14
RAM	Graf 132	24	Oudenburg	military	burial	325-410	3/4	75	58	30	15	38	43	13
RAM	Graf 138	25	Oudenburg	military	burial	350-410	5	83	56	33	14	36	45	*
RAM	Graf 152	26	Oudenburg	military	burial	350-410	5	68	40	*	*	*	*	20
RAM	Graf 165	27	Oudenburg	military	burial	300-365	2	63	48	22	12	31	38	9
RAM	Graf 169	28	Oudenburg	military	burial	325-410	3/4	67	48	29	13	30	43	12
RAM	Graf 172	29	Oudenburg	military	burial	325-410	3/4	72	43	26	10	*	*	11
RAM	Graf 188	30	Oudenburg	military	burial	325-410	3/4	66	41	26	9	29	31	12
RAM	Graf 190	31	Oudenburg	military	burial	325-410	3/4	64	54	28	14	34	21	12
RAM	Graf 206	32	Oudenburg	military	burial	300-365	2	75	62	29	17	33	47	15
RAM	Verhelst	33	Oudenburg	military	burial	325-410	3/4	*	*	*	*	*	*	*
AOE	KL17	34	Oudenburg	military	fort	280-320	1	25	47	26	15	*	*	7
AOE	KL90	35	Oudenburg	military	fort	280-320	1	61	31	30	15	38	29	10
AOE	KL91	36	Oudenburg	military	fort	280-320	1	63	50	27	15	33	27	9
AOE	KL92	37	Oudenburg	military	fort	350-410	5	63	42	27	11	30	38	14
AOE	KL93	38	Oudenburg	military	fort	300-365	2	38	28	27	12	*	*	11
AOE	KL94	39	Oudenburg	military	fort	3rd century	0	71	40	31	13	43	26	7
AOE	KL95	40	Oudenburg	military	fort	300-365	2	85	55	32	17	41	40	14
AOE	KL96	41	Oudenburg	military	fort	3rd century	0	72	40	29	16	41	24	5
AOE	KL97	42	Oudenburg	military	fort	3rd century	0	48	28	25	17	36	*	4
AOE	KL98	43	Oudenburg	military	fort	3rd century	0	41	23	32	17	33	*	4
AOE	KL99	44	Oudenburg	military	fort	3rd century	0	59	37	26	18	30	25	7
AOE	KL107	45	Oudenburg	military	fort	3rd century	0	41	36	25	17	34	*	4

AOE	KL108	46	Oudenburg	military	fort	uncertain	INDET	*	*	*	*	*	*	*
AOE	KL110	47	Oudenburg	military	fort	3rd century	0	25	36	26	18	*	*	6
AOE	KL111	48	Oudenburg	military	fort	3rd century	0	58	42	26	14	30	18	4
AOE	KL112	49	Oudenburg	military	fort	3rd century	0	64	44	28	16	37	22	5
GRMT	412	50	Tongeren	city	settlement	325-410	3/4	65	43	22	13	29	32	10
GRMT	4264	51	Tongeren	city	settlement	300-365	2	68	42	30	14	37	28	6
GRMT	4070 C	52	Tongeren	city	burial	3rd century	0	63	32	25	16	37	21	*
GRMT	74.A.2	53	Tongeren	city	burial	3rd century	0	72	48	28	18	40	25	6
GRMT	74.A.35	54	Tongeren	city	burial	300-365	2	83	56	26	16	30	46	14
GRMT	74.A.5	55	Tongeren	city	burial	325-410	3/4	82	62	28	17	37	17	14
GRMT	GRM 1376	56	Tongeren	city	settlement	325-410	3/4	79	52	28	16	36	42	14
GRMT	GRM 1377	57	Tongeren	city	settlement	325-410	3/4	73	48	26	13	31	36	11
GRMT	GRM 1378	58	Tongeren	city	settlement	325-410	3/4	*	*	26	*	*	36	*
GRMT	GRM 1379	59	Tongeren	city	settlement	300-365	2	*	47	*	11	*	*	13
GRMT	GRM 2852	60	Tongeren	city	settlement	280-320	1	69	49	34	15	36	29	6
GRMT	Sc.109	61	Tongeren	city	settlement	350-410	5	75	48	28	12	36	35	16
GRMT	Sc.110	62	Tongeren	city	settlement	325-410	3/4	87	56	24	13	37	44	13
RAAKVLAK	RV-Ge	63	Gent	unknown	ex situ	300-365	2	52	33	17	10	23	29	7
RAAKVLAK	RV-Ou	64	Oudenburg	unknown	ex situ	300-365	2	76	52	23	15	32	39	11
RAAKVLAK	RV-Ti	65	Tienen	unknown	ex situ	325-410	3/4	75	45	28	13	34	36	11
RAAKVLAK	RV-To	66	Tongeren	unknown	ex situ	300-365	2	68	49	24	14	31	31	10
RMOL	RMOL03	67	Ravenstein	unknown	unknown	350-410	5	90	62	28	21	36	46	13

RMOL	RMOL04	68	Nijmegen	unknown	unknown	325-410	3/4	89	55	29	13	36	48	12
RMOL	RMOL05	69	Maasdriel	unknown	ex situ	325-410	3/4	80	47	26	14	30	44	12
RMOL	RMOL06	70	Nijmegen	unknown	ex situ	300-365	2	75	50	26	14	34	31	13
RMOL	RMOL07	71	Nijmegen	unknown	ex situ	280-320	1	45	45	31	15	36	*	8
RMOL	RMOL08	72	Nijmegen	unknown	ex situ	325-410	3/4	83	56	26	17	34	45	13
RMOL	RMOL25	73	Wijk bij Duurstede	unknown	settlement	325-410	3/4	75	48	23	14	31	38	11
RMOL	RMOL26	74	Wijk bij Duurstede	military	settlement	280-320	1	*	*	26	*	31	*	*
RMOL	RMOL29	75	Wijk bij Duurstede	military	settlement	300-365	2	63	46	32	15	33	33	12
RMOL	RMOL31	76	Alem	unknown	ex situ	280-320	1	62	*	28	*	36	31	*
RMOL	RMOL32	77	Alem	unknown	ex situ	325-410	3/4	76	51	25	13	28	39	12
RMOL	RMOL36	78	Nijmegen	unknown	ex situ	280-320	1	66	47	24	16	33	27	7
RMOL	RMOL37	79	Nijmegen	unknown	ex situ	300-365	2	56	41	21	11	25	28	10
RMOL	RMOL38	80	Nijmegen	unknown	ex situ	3rd century	0	70	41	29	19	41	27	3
RMOL	RMOL39	81	Nijmegen	unknown	ex situ	3rd century	0	*	*	30	*	*	22	*
RMOL	RMOL40	82	Nijmegen	unknown	ex situ	280-320	1	*	*	26	*	34	*	5
RMOL	RMOL41	83	Nijmegen	unknown	ex situ	3rd century	0	52	32	19	15	29	17	4
RMOL	RMOL42	84	Nijmegen	unknown	ex situ	280-320	1	75	*	27	*	34	32	10
RMOL	RMOL43	85	Den Haag	military	settlement	3rd century	0	55	26	22	12	34	18	4
RMOL	RMOL44	86	Alphen aan de Rijn	military	settlement	3rd century	0	*	36	*	18	*	*	4

RMOL	RMOL46	87	Wijk bij Duurstede	military	settlement	3rd century	0	55	37	22	17	35	20	4
RMOL	RMOL47	88	Wijk bij Duurstede	military	settlement	3rd century	0	62	36	26	16	35	28	4
RMOL	RMOL48	89	Wijk bij Duurstede	military	settlement	3rd century	0	*	*	*	*	*		*
ADN	Nij 07	90	Nijmegen	city	burial	280-320	1	74	27	31	12	43	32	*
ADN	Nij 08	91	Nijmegen	city	burial	300-365	2	82	55	27	16	40	38	9
ADN	Nij 09	92	Nijmegen	city	burial	300-365	2	78	49	24	12	34	37	10
ADN	Nij 10	93	Nijmegen	city	settlement	280-320	1	*	24	*	12	*	*	7
ADN	Nij 11	94	Nijmegen	city	settlement	uncertain	INDET	*	*	*	*	*	*	16
ADN	Nij 12	95	Nijmegen	city	settlement	325-410	3/4	*	24	*	14	*	*	12
ADN	Nij 13	96	Nijmegen	military	ex situ	280-320	1	38	27	29	13	31	*	7
ADN	Nij 14	97	Nijmegen	military	ex situ	280-320	1	70	56	27	19	38	30	11
ADN	Nij 15	98	Nijmegen	military	ex situ	280-320	1	52	51	30	14	38	*	9
ADN	Nij 16	99	Nijmegen	military	ex situ	325-410	3/4	*	23	*	12	*	*	12
ADN	Nij 17	100	Nijmegen	military	ex situ	325-410	3/4	47	*	24	*	*	39	*
ADN	Nij 18	101	Nijmegen	military	ex situ	uncertain	INDET	*	24	*	*	*	*	13
ADN	Nij 19	102	Nijmegen	military	ex situ	325-410	3/4	*	29	*	15	*	*	12
ADN	Nij 20	103	Nijmegen	military	ex situ	325-410	3/4	*	25	*	15	*	*	11
ADN	Nij 21	104	Nijmegen	military	ex situ	325-410	3/4	52	59	30	16	40	*	13
ADN	Nij 22	105	Nijmegen	military	ex situ	325-410	3/4	*	26	*	12	*	*	13
ADN	Nij 23	106	Nijmegen	military	ex situ	280-320	1	*	*	*	*	*	28	9
ADN	Nij 24	107	Nijmegen	military	ex situ	325-410	3/4	*	29	*	15	*	*	12
ADN	Nij 25	108	Nijmegen	military	ex situ	300-365	2	62	*	25	*	30	37	*
ADN	Nij 26	109	Nijmegen	military	ex situ	375-410	6	*	31	*	15	*	*	14
ADN	Nij 27	110	Nijmegen	military	ex situ	uncertain	INDET	*	22	*	*	*	*	14
ADN	Nij 28	111	Nijmegen	military	ex situ	uncertain	INDET	*	18	*	*	*	*	13

ADN	Nij 29	112	Nijmegen	military	ex situ	280-320	1	65	*	21	*	33	37	*
ADN	Nij 30	113	Nijmegen	military	ex situ	325-410	3/4	70	42	24	12	30	33	13
ADN	Nij 31	114	Nijmegen	military	ex situ	325-410	3/4	53	*	27	*	*	41	*
ADN	Nij 32	115	Nijmegen	military	ex situ	375-410	6	*	34	*	*	*	*	11
ADN	Nij 33	116	Nijmegen	military	ex situ	280-320	1	45	27	22	14	29	12	7
ADN	Nij 34	117	Nijmegen	military	ex situ	280-320	1	*	25	*	10	*	*	9
ADN	Nij 36	118	Nijmegen	military	ex situ	280-320	1	68	44	33	21	34	29	7
ADN	Nij 39	119	Nijmegen	military	ex situ	uncertain	INDET	*	29	*	8	*	*	13
ADN	Nij 40	120	Nijmegen	military	ex situ	280-320	1	35	*	20	10	30	*	*
ADN	Nij 41	121	Nijmegen	military	ex situ	280-320	1	66	38	23	12	38	23	9
ADN	Nij 42	122	Nijmegen	military	ex situ	325-410	3/4	70	51	29	14	35	26	10
ADN	Nij 43	123	Nijmegen	military	ex situ	300-365	2	44	50	19	10	36	*	13
ADN	Nij 44	124	Nijmegen	military	ex situ	325-410	3/4	15	42	16	11	*	*	9
ADN	Nij 45	125	Nijmegen	military	ex situ	325-410	3/4	61	41	20	9	25	30	10
ADN	Nij 46	126	Nijmegen	city	burial	325-410	3/4	95	61	31	14	36	51	15
ADN	Nij 47	127	Lent	city	settlement	300-365	2	29	48	29	14	29	*	10
ADN	Nij 48	128	Nijmegen	city	burial	325-410	3/4	86	52	26	15	36	41	12
ADN	Nij 49	129	Nijmegen	city	burial	325-410	3/4	87	54	30	14	36	45	12
ADN	Nij 50	130	Nijmegen	city	burial	300-365	2	80	52	27	12	35	41	11
ADN	Nij 51	131	Nijmegen	city	burial	325-410	3/4	83	50	28	13	35	43	12
KAM	KAM 01	132	Nijmegen	rural	settlement	300-365	2	76	*	22	*	35	37	11
KAM	KAM 02	133	Beneden-Leeuw	rural	settlement	325-410	3/4	86	50	27	14	33	47	13
KAM	KAM 03	134	Beuningen	rural	settlement	uncertain	INDET	*	*	*	*	*	*	15
KAM	KAM 04	135	Nijmegen	unknown	ex situ	325-410	3/4	69	37	23	9	30	37	10
KAM	KAM 05	136	Nijmegen	unknown	ex situ	280-320	1	78	44	26	14	40	32	11

KAM	KAM 06	137	Nijmegen	unknown	ex situ	280-320	1	65	48	27	14	35	27	8
KAM	KAM 07	138	Nijmegen	unknown	ex situ	280-320	1	76	52	29	14	40	28	7
KAM	KAM 08	139	Nijmegen	unknown	ex situ	300-365	2	69	50	24	11	34	28	11
KAM	KAM 09	140	Nijmegen	unknown	ex situ	280-320	1	68	47	27	13	35	30	7
KAM	KAM 10	141	Nijmegen	unknown	ex situ	325-410	3/4	92	53	28	17	38	48	14
KAM	KAM 11	142	Nijmegen	unknown	ex situ	325-410	3/4	75	48	26	12	31	39	12
KAM	KAM 13	143	Nijmegen	unknown	ex situ	325-410	3/4	81	49	25	11	33	43	12
KAM	KAM 14	144	Nijmegen	unknown	ex situ	300-365	2	93	52	28	13	39	49	14
KAM	KAM 15	145	Nijmegen	unknown	ex situ	325-410	3/4	70	46	25	12	34	32	11
KAM	KAM 16	146	Nijmegen	unknown	ex situ	280-320	1	63	48	23	15	34	24	8
KAM	KAM 17	147	Nijmegen	unknown	ex situ	280-320	1	68	47	25	15	37	26	7
KAM	KAM 18	148	Nijmegen	unknown	ex situ	325-410	3/4	90	51	29	15	38	45	13
KAM	KAM 19	149	Nijmegen	unknown	ex situ	300-365	2	66	65	36	16	44	*	11
KAM	KAM 20	150	Nijmegen	unknown	ex situ	325-410	3/4	72	48	28	14	31	35	13
KAM	KAM 21	151	Nijmegen	unknown	ex situ	280-320	1	57	*	21	*	27	26	7
KAM	KAM 22	152	Nijmegen	unknown	ex situ	325-410	3/4	73	44	28	12	30	36	12
KAM	KAM 23	153	Nijmegen	unknown	ex situ	325-410	3/4	94	60	29	15	37	54	13
KAM	KAM 24	154	Nijmegen	unknown	ex situ	325-410	3/4	83	52	30	13	36	41	12
KAM	KAM 25	155	Nijmegen	unknown	ex situ	280-320	1	63	51	24	14	33	20	7

KAM	KAM 26	156	Nijmegen	unknown	ex situ	280-320	1	80	57	31	18	43	34	9
KAM	KAM 27	157	Nijmegen	unknown	ex situ	325-410	3/4	76	49	26	13	31	37	11
KAM	KAM 28	158	Nijmegen	unknown	ex situ	3rd century	0	65	25	27	12	38	22	5
KAM	KAM 30	159	Nijmegen	unknown	ex situ	300-365	2	60	43	20	8	24	30	9
KAM	KAM 31	160	Nijmegen	unknown	ex situ	325-410	3/4	95	62	31	15	36	52	13
KAM	KAM 32	161	Nijmegen	unknown	ex situ	325-410	3/4	82	48	26	11	30	47	12
KAM	KAM 33	162	Nijmegen	unknown	ex situ	325-410	3/4	67	43	24	10	27	37	10
KAM	KAM 34	163	Nijmegen	unknown	ex situ	300-365	2	66	44	25	10	28	31	12
KAM	KAM 35	164	Nijmegen	unknown	ex situ	325-410	3/4	77	46	25	11	31	38	11
KAM	KAM 36	165	Nijmegen	unknown	ex situ	375-410	6	40	62	31	19	36	*	12
KAM	KAM 37	166	Nijmegen	unknown	ex situ	300-365	2	83	51	26	12	40	37	13
KAM	KAM 38	167	Nijmegen	unknown	ex situ	300-365	2	69	45	24	13	34	34	9
KAM	KAM 39	168	Nijmegen	unknown	ex situ	280-320	1	70	46	26	12	35	30	7
KAM	KAM 40	169	Nijmegen	unknown	ex situ	300-365	2	78	47	25	13	32	37	9
KAM	KAM 41	170	Nijmegen	unknown	ex situ	300-365	2	68	51	28	14	34	28	10
KAM	KAM 42	171	Nijmegen	unknown	ex situ	325-410	3/4	81	52	24	12	35	40	11
KAM	KAM 43	172	Nijmegen	unknown	ex situ	325-410	3/4	92	59	27	17	39	48	12
KAM	KAM 44	173	Nijmegen	unknown	ex situ	300-365	2	72	48	24	11	32	31	10
KAM	KAM 45	174	Nijmegen	unknown	ex situ	325-410	3/4	87	52	24	12	31	50	12

KAM	KAM 46	175	Nijmegen	unknown	ex situ	3rd century	0	58	36	17	10	29	25	6
KAM	KAM 47	176	Nijmegen	unknown	ex situ	325-410	3/4	81	47	27	11	31	44	10
KAM	KAM 48	177	Nijmegen	military	settlement	uncertain	INDET	26	*	*	°	19	12	*
KAM	KAM 49	178	Nijmegen	military	settlement	3rd century	0	69	46	25	12	39	24	6
KAM	KAM 50	179	Beuningen	rural	settlement	280-320	1	63	43	22	12	36	24	8
KAM	KAM 51	180	Nijmegen	unknown	ex situ	350-410	5	78	50	29	14	37	38	13
KAM	KAM 52	181	Nijmegen	city	burial	325-410	3/4	90	56	30	14	37	46	13
KAM	KAM 53	182	Nijmegen	city	burial	300-365	2	76	49	28	11	38	32	10
KAM	KAM 54	183	Nijmegen	city	burial	375-410	6	94	59	33	19	37	52	14
KAM	KAM 55	184	Nijmegen	city	burial	280-320	1	72	54	26	12	37	26	7
KAM	KAM 56	185	Nijmegen	city	burial	300-365	2	83	69	32	16	37	34	13
KAM	KAM 57	186	Nijmegen	city	burial	325-410	3/4	95	62	31	13	41	47	14
KAM	KAM 58	187	Nijmegen	city	burial	300-365	2	79	50	27	11	40	34	13

English summary

Key words: Late Roman society, Northern Gaul, Low Countries, material culture, Flemish archaeological record, change, migration, hybridisation.

The Late Roman period has long been regarded as a time of decline, violence and mass migrations. Northern Gaul specifically was thought to have been mainly abandoned in the aftermath of the '3rd century crisis' as the result of the devastating *barbarian* invasions from AD 260-270. The many civil wars and internal conflict caused the region to be somewhat neglected by Rome until Gaul was reorganised by the Tetrarchy and the territories of Northern Gaul were reintegrated in the Roman West. In the course of the 4th century some brief periods of revival were achieved by new (Germanic) settlements. By the late 4th century, the external pressure and internal division of the Roman Empire became too severe and ca. AD 408 the Roman troops were recalled from the Rhine frontier and Saxon shore forts. This generally marks the end for the Roman occupation in the Low Countries, after which the Germanic (Frankish) communities in the region developed into the later Merovingian state.

This historical narrative has been closely associated with the notion of decline and fall in Roman archaeology in Belgium and the Netherlands causing a significance difference in knowledge between the Early and Mid-Roman phases and the Late Roman period. This dissertation is aimed at making an effort to fill part of that gap. The current research focusses on exploring social and cultural change by means of archaeological evidence in order to improve our understanding of the Late Roman society in Northern Gaul.

First, a test-case is made on the archaeological record of Flanders in order to assess the current state of knowledge and evaluate the presence and recognisability of Late Roman archaeology. By means of compiling an inventory from literature, archives, excavation reports and archaeological databases, patterns concerning spatiality and chronology are

explored. Followed by the evaluation of all Late Roman sites, finds and dates of seven micro-regions to establish occupation density and activity between the late 3rd and 5th century. These results - combined with the spatial and chronological patterns - form a picture of a dispersed mixed rural-military society clustering around rivers and roads. Connectivity and access are considered to be major decisive factors in the continuation and repopulation of sites and landscapes and are argued to be related to military and economic activity. Additionally, some constructive approaches are proposed to enhance the recognisability of Late Roman archaeology in Flanders and the Low Countries, as well as a critical reassessment of the traditional historical narrative by which archaeologist have often interpreted the Late Roman period.

After this general overview of the Late Roman phase in Flanders, three case studies are presented to investigate the relation between material culture and sociocultural change. All three case studies are aimed to study the society of the frontier zone and direct hinterland of Northern Gaul, which corresponds roughly with the present day Low Countries. For each case the material from this region forms the centre of the investigation, although it is frequently compared with evidence from the northern Netherlands, northwest Germany and northern France in order to improve the overall interpretation. The study of the material culture is executed in a bottom-up approach in which the focus is orientated towards the physical properties of the object and its context. In order to do so, an interdisciplinary methodology is applied, consisting of aspects from archaeology, history, art history, archaeometry, anthropology and sociology.

The first case study explores the relation between handmade pottery and mobility. Given that handmade pottery can be seen as residing closely to the habitus of an individual or community, this indicates a high chance of the persistence of tradition in the process of creating handmade pottery. Which is expressed in the 'style' of the pots that comprises its shape and decoration, but also its fabric. Therefore petrographic analyses are performed on samples from handmade ceramics that were dated between ca. AD 250 and 450 by their context. These results contain information on provenance and technology, and are combined with spatial distribution and other 'style' attributes to create a model of continued Gallo-Roman practise, Germanic immigration and the interaction between the varying communities present in Northern Gaul.

The second case study investigates the Late Roman type-fossil of the 'Late Roman terra nigra foot-vessels' of which the main distribution appears to be limited to Northern Gaul. Despite its frequent occurrence, the general knowledge on the production and

consumption of this type of vessels is also limited. By applying petrographic and geochemical analyses, new insights in the production modes and potential provenance is acquired. The results point to at least two major production centres, one on the Roman side of the Rhine frontier and one in the Germanic territories. Alongside major craft productions also imitations and small household production appear to have occurred to varying degrees. Furthermore, the evaluation of chronology and distribution provides additional insights in this type of vessel as a hybrid product of interaction originating in the Lower Rhine frontier and developing in Northern Gaul throughout the 4th and 5th century.

The third case study examines the changes in the development of the crossbow brooch between the 3rd and the 6th century. This brooch type was closely connected to the Roman army and through the rise of the military elite, it became a symbol of Roman authority and power that even would survive the fall of the Roman West. After creating a full cultural biography of this brooch type, the focus is directed towards the brooches found in the Low Countries. All their physical aspects are examined – size, shape, decoration and composition – by combining typology, handheld XRF analysis and metric variation. The results yield new considerations regarding matters of regionality and state control in their production by investigating variation and standardisation. A new narrative is proposed which provides a chronologically differentiated view on the social position of the owner and the implications for the adoption of military styles by the (civil) elites and aristocracies.

Finally, the results of all case studies – the archaeological record of Flanders, handmade pottery, foot-vessels and crossbow brooches – are joined to reconstruct the social and cultural dynamics in the Lower Rhine frontier and the adjacent hinterland. The concepts of militarisation and migration are argued to be the main processes that drive sociocultural change between the 3rd and 5th century in Northern Gaul. The final considerations present the data in a coherent model for the region of the Low Countries.

The main conclusion of this study is that the Late Roman occupation varies between mainly rural areas or predominantly military zones, depending on landscape and provincial structure. The rural areas are characterised by small subsistence communities of Gallo-Roman, Germanic or mixed nature that maintained access to local and regional networks via the main roads and rivers. In general, the military zones revealed little local rural or civilian occupation, which indicates that the rivers, roads and coastline were active military supply networks. These results stress the importance of connectivity,

militarisation and migration for Late Roman Northern Gaul and indicate that the people living in the area are part of an increasingly merged society throughout the 3rd to 5th century.

Nederlandse samenvatting

Key words: laat-Romeinse samenleving, Noord-Gallië, Lage Landen, materiële cultuur, Vlaamse archeologie, verandering, migratie, hybridisatie.

De laat-Romeinse periode is lang beschouwd als een tijd van verval, geweld en massamigraties. Over Noord-Gallië werd er vooral gedacht dat dit gebied hoofdzakelijk verlaten was na de 'crisis' van de 3de eeuw, als gevolg van de allesverwoestende invallen van de *barbaren* ca. 260-270 n.Chr. Door de vele burgeroorlogen en interne conflicten werd dit gebied verwaarloosd door Rome, totdat Gallië werd gereorganiseerd door de Tetrarchie en opnieuw geïntegreerd in het West-Romeinse Rijk. In de loop van de 4de eeuw braken er enkele kortstondige momenten van heropbloei aan, hoewel een groot deel van de nieuwe nederzettingen toegewezen werd aan Germaanse volkeren die zich binnen de grenzen kwamen vestigen of hier geplaatst werden. Tegen het einde van de 4de eeuw was de externe druk en interne verdeling van het Romeinse Rijk te groot geworden en rond 408 n.Chr. werden de Romeinse troepen teruggetrokken van de grensgebieden aan de Rijn en de Noordzeekust. Deze historische mijlpaal markeert doorgaans het einde van de Romeinse periode voor de Lage Landen, gevolgd door de groei van de Germaanse gemeenschappen tot een Frankische samenleving die zich ontwikkelde in de latere Merovingische staat.

Deze algemene historische beschouwing, die nauw verbonden is met de *decline and fall*-mentaliteit in Romeinse archeologie in België en Nederland, heeft tot een opmerkelijk verschil in kennis tussen de vroeg- en midden-Romeinse fasen en de laat-Romeinse tijd geleid. Deze studie is bedoeld om een eerste stap te zetten om die kloof te dichten. In tegenstelling tot het voormalig hoofdzakelijk etnisch discours in de laat-Romeinse archeologie, wordt hier een socioculturele visie op het archeologisch materiaal

gehanteerd. Het hoofddoel van deze thesis is om bij te dragen aan de huidige kennis van Noord-Gallië tussen de 3de en de 5de eeuw n.Chr.

Allereerst is er een beoordeling van de huidige staat van archeologische kennis gemaakt voor het testgebied van Vlaanderen om de aanwezigheid en herkenbaarheid van laat-Romeinse archeologie te evalueren. Een inventaris is samengesteld op basis van een uitgebreide literatuurstudie over publicaties, archieven, opgravingsrapporten en archeologische databanken. Door middel van deze inventaris worden mogelijke spatiale en chronologische patronen onderzocht. Vervolgens worden alle sites, vondsten en chronologische data geëvalueerd voor zeven microregio's, wat de basis vormt voor de discussie over bewoningsdichtheid en activiteit tussen de late 3de en de 5de eeuw. Deze resultaten worden gecombineerd met de vastgestelde spatiale en chronologische trends wat samen een beeld oplevert van een gemengd ruraal-militaire samenleving die gereduceerd was in omvang en landbezetting ten opzichte van de 2de eeuw. Connectiviteit en toegankelijkheid zijn twee belangrijke factoren in de continuïteit en herbezetting van sites en landschappen, wat ook beïnvloed werd door militaire en economische activiteiten. Verder worden er enkele constructieve methodes voorgesteld om de herkenbaarheid van de laat-Romeinse archeologie in Vlaanderen en de Lage Landen te verhogen, alsook een kritische benadering ten opzichte van de traditioneel historische visie die gebruikt wordt door archeologen om de laat-Romeinse periode te interpreteren.

Na dit algemeen overzicht van de laat-Romeinse fase in Vlaanderen worden er drie casestudy's voorgesteld om de relatie tussen materiële cultuur en socioculturele verandering te onderzoeken. Hiervoor zijn twee aardewerkcategorieën en één type fibula geselecteerd. Deze casestudy's hebben als doel om de samenleving in het grensgebied van het directe achterland van Noord-Gallië te bestuderen, een gebied dat ongeveer overeenkomt met de Lage Landen. Het materiaal verzameld uit dit gebied vormt telkens de kern van elke casestudy, hoewel deze frequent vergeleken worden met vondsten uit Noord-Nederland, Noordwest-Duitsland en Noord-Frankrijk om de overkoepelende interpretatie te bevorderen. De studie van de materiële cultuur wordt aangepakt vanuit een 'bottom-upvisie' die focust op de fysieke eigenschappen van het object en zijn context. Deze aanpak is interdisciplinair en combineert elementen uit de archeologie, geschiedenis, kunstgeschiedenis, archeometrie, antropologie en sociologie.

De eerste casestudy verkent de relatie tussen handgemaakt aardewerk en mobiliteit. Handgemaakt aardewerk kan beschouwd worden als materiaal dat nauw verwant is aan

de *habitus* van een individu of gemeenschap, dit wil zeggen dat traditie een grotere rol blijft spelen in het creatieve proces. De traditie is merkbaar in de stijl van de potten, met andere woorden in de vorm, de decoratie en het baksel. Daarom is er gekozen om petrografische analyses uit te voeren op handgemaakte keramiek die gedateerd is tussen ca. 250 en 450 n.Chr. op basis van de context. De resultaten bevatten immers informatie over herkomst en technologie die – in combinatie met spatiale distributie en andere 'stijlattributen' – bijdragen tot een model over de verderzetting van Gallo-Romeinse traditie, Germaanse immigratie en de interactie tussen de verschillende gemeenschappen in Noord-Gallië.

De tweede casestudy onderzoekt het laat-Romeins 'gidsfossiel' van laat-Romeinse terranigra standvoetbekers. De verspreiding van deze aardewerkcategorie lijkt beperkt te zijn tot het gebied van Noord-Gallië, maar ondanks dat dit een veel voorkomende vondst is, is de algemene kennis over de productie en consumptie van dit type objecten zeer beperkt. Nieuwe resultaten in verband met productie *modes* en mogelijke herkomstgebieden worden verkregen door het toepassen van petrografische en geochemische analyses. De resultaten tonen aan dat er minstens twee grote productiecentra bestonden: één op Romeins grondgebied en één aan de overkant van de Rijn in de Germaanse territoria. Naast grote professionele centra waren er ook meerdere kleinere imitatie- en huishoudelijke producties op verschillende schaal. Verder bezorgt ook de chronologische en distributie-evaluatie nieuwe inzichten in deze materiaalcategorie als het hybride product van de interactie in het Nederrijn-grensgebied en de ontwikkeling in Noord-Gallië doorheen de 4de en 5de eeuw.

De derde casestudy bestudeert de veranderingen in de ontwikkeling van de kruisboogfibula tussen de 3de en de 6de eeuw. Dit type fibula hing nauw samen met de militaire samenleving en groeide uit tot een symbool voor Romeinse autoriteit en macht door het opkomen van de militaire elite die de val van het West-Romeinse Rijk zou overleven. Eerst wordt een volledige culturele biografie voorgesteld waarbij de aandacht georiënteerd wordt op de vondsten uit de Lage Landen. Alle fysieke eigenschappen worden onderzocht – zoals vorm, afmetingen, decoratie en samenstelling – aan de hand van een combinatie van typologie, *handheld* XRF-analyse en metrische variaties. De resultaten in verband met variatie en standaardisatie verschaffen nieuwe perspectieven op aspecten van regionaliteit en staatcontrole in het productieproces. Een nieuw model wordt voorgesteld dat een chronologisch genuanceerd beeld geeft over de sociale positie

van de eigenaar en de implicaties voor het aannemen van de militaire stijl door de (burgerlijke) elites en aristocratie.

Als laatste worden de resultaten van alle casestudy's gecombineerd om de sociale en culturele dynamieken in het Nederrijn-grensgebied en het achterland te reconstrueren. Concepten zoals militarisatie en migratie worden beschouwd als de hoofdprocessen achter de socioculturele veranderingen tussen de 3de en 5de eeuw in Noord-Gallië. Daarna worden de verzamelde data voorgesteld in een coherent model voor de regio van de Lage Landen.

De hoofdconclusie van dit onderzoek is dat de laat-Romeinse bewoning varieert tussen voornamelijk rurale samenlevingen of overwegend militaire zones, afhankelijk van het landschap en de locatie binnen de provinciale structuur. De rurale gebieden worden gekenmerkt door kleine zelfvoorzienende gemeenschappen met een kleine surplusproductie van Gallo-Romeinse, Germaanse of gemengde aard, waarvan de aansluiting tot lokale en regionale netwerken verloopt via de rivieren en de hoofdwegen. De militaire zones vertonen meestal weinig civiele en rurale nederzettingen, wat de aanwezigheid van een bevoorradingsnetwerk langs de wegen, rivieren en kustlijn aantoont. Deze algemene resultaten benadrukken het belang van connectiviteit, militarisatie en migratie in laat-Romeins Noord-Gallië en tonen aan de mensen die in het gebied leefden onderdeel waren van een in stijgende mate hybridiserende samenleving tussen de 3de en de 5de eeuw.